THE ACCOUNTING REVIEW

VOLUME 80, No. 3 JULY 2005

CHRISTINE A. BOTOSAN and MARY STANFORD
Managers' Motives to Withhold Segment Disclosures and the Effect of SFAS No. 131 on Analysts' Information Environment

MICHAEL L. ETTREDGE, SOO YOUNG KWON, DAVID B. SMITH, and PAUL A. ZAROWIN
The Impact of SFAS No. 131 Business Segment Data on the Market's Ability to Anticipate Future Earnings

DON HERRMANN and WAYNE B. THOMAS
Rounding of Analyst Forecasts

JESSEN L. HOBSON and STEVEN J. KACHELMEIER
Strategic Disclosure of Risky Prospects: A Laboratory Experiment

PETER JOOS and GEORGE A. PLESKO
Valuing Loss Firms

LISA KOONCE, MARLYS GASCHO LIPE, and MARY LEA McANALLY
Judging the Risk of Financial Instruments: Problems and Potential Remedies

MARK W. NELSON, STEVEN D. SMITH, and ZOE-VONNA PALMROSE
The Effect of Quantitative Materiality Approach on Auditors' Adjustment Decisions

ED O'DONNELL and JOSEPH J. SCHULTZ, JR.
The Halo Effect in Business Risk Audits: Can Strategic Risk Assessment Bias Auditor Judgment about Accounting Details?

GRACE POWNALL and PAUL J. SIMKO
The Information Intermediary Role of Short Sellers

ANNE WYATT
Accounting Recognition of Intangible Assets: Theory and Evidence on Economic Determinants

[illegible] 14.09.05

P-140

QUARTERLY JOURNAL OF THE
AMERICAN ACCOUNTING ASSOCIATION

AMERICAN ACCOUNTING ASSOCIATION

The members of the 2004–2005 Executive Committee of the Association are as follows:

President	Jane F. Mutchler, Georgia State University
President-Elect	Judy D. Rayburn, University of Minnesota
Vice President	Carolyn M. Callahan, University of Arkansas
Vice President–Education	O. Finley Graves, University of North Texas
Vice President–Finance	Susan F. Haka, Michigan State University
Vice President–International	Lee David Parker, University of Adelaide
Vice President–Professional Relations	Mark M. Chain, Deloitte
Vice President–Publications	Robert Libby, Cornell University
Vice President–Research	John C. Fellingham, The Ohio State University
Vice President–Sections and Regions	Susan V. Crosson, Santa Fe Community College
Past President	William L. Felix, Jr., The University of Arizona

The American Accounting Association was founded in 1916 as the American Association of University Instructors in Accounting. Its present name was adopted in 1936. The Association is a voluntary organization of persons interested in accounting education, research, and practice. Full membership entitles one to receive *Accounting Education News*, a selection of one, two, or all three of the Association-wide journals (*The Accounting Review, Accounting Horizons,* and *Issues in Accounting Education*) and the opportunity to purchase Association publications at a discount.

Membership in the Association is available at the following annual rates:

Full membership:
The membership dues are based on the selection of one, two, or all three of the following Association-wide journals: *The Accounting Review, Accounting Horizons,* and *Issues in Accounting Education.*
(This does not include Section journals.)

Select one Association-wide journal	U.S. $135.00	with Electronic Option $155.00
Select two Association-wide journals	U.S. $145.00	with Electronic Option $165.00
All three Association-wide journals	U.S. $155.00	with Electronic Option $175.00

Associate membership for students residing in the United States and Canada:

Select one Association-wide journal	U.S. $20.00	with Electronic Option $40.00
Select two Association-wide journals	U.S. $30.00	with Electronic Option $50.00
All three Association-wide journals	U.S. $40.00	with Electronic Option $60.00

Electronic journal option available for an additional U.S. $20.00 to above-mentioned full-membership and associate-membership dues.

In addition, full members may belong to one or more Sections: Accounting, Behavior and Organizations; Accounting Programs Leadership Group; American Taxation Association; Artificial Intelligence/Emerging Technologies; Auditing; Financial Accounting and Reporting; Gender Issues in Accounting; Government and Nonprofit; Information Systems; International Accounting; Management Accounting; Public Interest; Teaching and Curriculum; and Two-Year College. Each Section assesses its own annual dues, which are collected by the Association.

Editorial correspondence and all manuscripts should be emailed to taruw@u.washington.edu or sent to Professor Terry Shevlin, Senior Editor, *The Accounting Review*, School of Business, Box 353200, University of Washington, Seattle, WA 98195-3200. As of June 1, 2005, all manuscripts should be emailed to TARUAZ@email.arizona.edu or sent to Professor Dan Dhaliwal, Senior Editor. *The Accounting Review*, The University of Arizona, Department of Accounting, McClelland Hall 301, 1130 E. Helen Street, Tucson, AZ 85721-0108.

The submission fee of $125.00 for members of the AAA or $200.00 for nonmembers should be paid online (VISA or MasterCard only) at: https://aaahq.org/AAAforms/journals/tarsubmit.cfm must be paid when article is submitted. Request for reprint permission, subscriptions, advertisements, and dues should be sent to American Accounting Association, 5717 Bessie Drive, Sarasota, FL 34233-2399 • Telephone: (941) 921-7747 • Fax: (941) 923-4093 • Email: Office@aaahq.org. Notice of change of address should be mailed at least eight weeks in advance to ensure undelayed receipt of *The Accounting Review.*

The Accounting Review (ISSN 0001-4826) is published four times a year in January, April, July, and October by the American Accounting Association, 5717 Bessie Drive, Sarasota, Florida 34233-2399. General subscriptions are available at the annual rate of U.S. $170; membership subscription rate is $25 with discounts available; and emeritus subscription rate is $8.75. Periodical postage paid at Sarasota, Florida and additional mailing offices. **POSTMASTER:** Send address change to ***The Accounting Review,*** 5717 Bessie Drive, Sarasota, Florida 34233-2399.

© 2005 American Accounting Association. All rights reserved. Printed in the United States of America.

Cul. H02076-21-to 28981

34

THE ACCOUNTING REVIEW

A QUARTERLY JOURNAL OF THE
AMERICAN ACCOUNTING ASSOCIATION

Senior Editor
Terry Shevlin
Editors
Lawrence Brown
Patricia Dechow
S. Jane Kennedy
Marlys Gascho Lipe
Madhav Rajan

P28981

VOL. 80 JULY 2005 No. 3

CHRISTINE A. BOTOSAN and MAR[illegible]
Managers' Motives to Withhold [illegible] the Effect of SFAS No. 131 on Analysts' Information En[illegible] 751

unting

MICHAEL L. ETTREDGE, SOO Y[illegible], and PAUL A. ZAROWIN
The Impact of SFAS No. 131 B[illegible] Market's Ability to Anticipate Future Earnings 773

80

DON HERRMANN and WAYNE B. THOMAS
Rounding of Analyst Forecasts 805

-4

JESSEN L. HOBSON and STEVEN J. KACHELM[illegible]ER
Strategic Disclosure of Risky Prospects: A Laboratory Experiment 825
PETER JOOS and GEORGE A. PLESKO
Valuing Loss Firms 847
LISA KOONCE, MARLYS GASCHO LIPE, and MARY LEA McANALLY
Judging the Risk of Financial Instruments: Problems and Potential Remedies 871
MARK W. NELSON, STEVEN D. SMITH, and ZOE-VONNA PALMROSE
The Effect of Quantitative Materiality Approach on Auditors' Adjustment Decisions 897
ED O'DONNELL and JOSEPH J. SCHULTZ, JR.
The Halo Effect in Business Risk Audits: Can Strategic Risk Assessment Bias Auditor Judgment about Accounting Details? 921
GRACE POWNALL and PAUL J. SIMKO
The Information Intermediary Role of Short Sellers 941
ANNE WYATT
Accounting Recognition of Intangible Assets: Theory and Evidence on Economic Determinants 967
Editorial Data 1005
Editorial Policy and Style Information 1007

Editorial Staff of *The Accounting Review*
2004–2005

SENIOR EDITOR
Terry Shevlin, University of Washington
EDITORS
Lawrence Brown, Georgia State University
Patricia Dechow, University of Michigan
S. Jane Kennedy, University of Washington
Marlys Gascho Lipe, University of Oklahoma
Madhav Rajan, Stanford University
EDITORIAL ASSISTANT
Kate Flynn Connolly, University of Washington

American Accounting Association

EXECUTIVE DIRECTOR
Tracey E. Sutherland
COMMUNICATIONS DEPARTMENT
Beverly Harrelson
Kathy Casper
Helen Griffith
Judy Cothern
Christine Govaars
Jan Kovarik (subcontracted)
OTHER AAA STAFF
Debora Gardner
Roland LaTulip
Linda Watterworth
Mary Cole
Pat Stein
James Szelminski
Barbara Brady
Peggy Turczyn
Myriam Chacon
Deirdre Harris (subcontracted)

Editorial Advisory and Review Board

Shannon W. Anderson, Rice University
Benjamin C. Ayers, University of Georgia
Frances L. Ayres, University of Oklahoma
William R. Baber, The George Washington University
Stephen P. Baginski, University of Georgia
Ramji Balakrishnan, The University of Iowa
Tim Baldenius, Columbia University
Orie E. Barron, Pennsylvania State University
Eli Bartov, New York University
Anne L. Beatty, The Ohio State University
Robert J. Bloomfield, Cornell University
Christine A. Botosan, University of Utah
Robert M. Bowen, University of Washington
Brian J. Bushee, University of Pennsylvania
Robert M. Bushman, The University of North Carolina at Chapel Hill
Paul K. Chaney, Vanderbilt University
C. Bryan Cloyd, University of Illinois at Urbana–Champaign
William M. Cready, The University of Texas at Dallas
Mark L. DeFond, University of Southern California
Michael J. Eames, Santa Clara University
Merle M. Erickson, University of Chicago
Paul Fischer, Pennsylvania State University
Jere R. Francis, University of Missouri–Columbia
Jennifer Francis, Duke University
Jonathan C. Glover, Carnegie Mellon University
Wayne R. Guay, University of Pennsylvania
David A. Guenther, University of Colorado at Boulder
Mahendra Gupta, Washington University
D. Eric Hirst, The University of Texas at Austin
Christopher D. Ittner, University of Pennsylvania
James J. Jiambalvo, University of Washington
Sanjay Kallapur, Purdue University
Ron Kasznik, Stanford University
Bin Ke, Pennsylvania State University
Deen Kemsley, Tulane University
William R. Kinney, Jr., The University of Texas at Austin
Lisa L. Koonce, The University of Texas at Austin
William N. Lanen, University of Michigan
Robert C. Lipe, University of Oklahoma
Joan L. Luft, Michigan State University
Russell J. Lundholm, University of Michigan
Joseph Magliolo III, Southern Methodist University
Laureen A. Maines, Indiana University
Steven R. Matsunaga, University of Oregon
Maureen F. McNichols, Stanford University
Kenneth A. Merchant, University of Southern California
Lillian F. Mills, The University of Arizona
Donald V. Moser, University of Pittsburg
James N. Myers, University of Illinois at Urbana–Champaign
Linda Myers, University of Illinois at Urbana–Champaign
Karen K. Nelson, Rice University
Mark W. Nelson, Cornell University
Patricia C. O'Brien, University of Waterloo
Kathy R. Petroni, Michigan State University
Morton Pincus, The University of Iowa
Jamie H. Pratt, Indiana University
Shivaram Rajgopal, University of Washington
D. Shores, University of Washington
Richard G. Sloan, University of Michigan
Geoffrey B. Sprinkle, Indiana University
Theodore Sougiannis, University of Illinois at Urbana–Champaign
Michael T. Stein, University of Oregon
Hun-Tong Tan, Nanyang Technology University/Singapore
Richard M. Tubbs, The University of Iowa
Sandra Vera-Muñoz, University of Notre Dame
Robert E. Verrecchia, University of Pennsylvania
Beverly R. Walther, Northwestern University
Michael Welker, Queen's University
Michael Willenborg, University of Connecticut
Hong Xie, University of Illinois at Urbana–Champaign

PAST EDITORS

1926–1929	William A. Paton
1929–1943	Eric L. Kohler
1944–1947	A. C. Littleton
1948–1949	Robert L. Dixon
1950–1959	Frank P. Smith
1960–1962	Robert K. Mautz
1963–1964	Lawrence L. Vance
1965–1967	Wendell Trumbull
1968–1970	Charles H. Griffin
1971–1972	Eldon S. Hendriksen
1973–1975	Thomas F. Keller
1976–1978	Don T. DeCoster
1978–1983	Stephen A. Zeff
1983–1987	Gary L. Sundem
1987–1990	William R. Kinney, Jr.
1990–1994	A. Rashad Abdel–khalik
1994–1997	Robert P. Magee
1997–2000	Gerald L. Salamon
2000–2002	Linda Smith Bamber

THE ACCOUNTING REVIEW
Vol. 80, No. 3
2005
pp. 751–771

Managers' Motives to Withhold Segment Disclosures and the Effect of SFAS No. 131 on Analysts' Information Environment

Christine A. Botosan
University of Utah

Mary Stanford
Texas Christian University

ABSTRACT: Using retroactive disclosures required by Statement of Financial Accounting Standards (SFAS) No. 131, we examine managers' incentives for withholding segment information under SFAS No. 14 and the impact of SFAS No. 131 on analysts' information environment for a sample of firms that previously reported as single-segment firms and initiated segment disclosure with SFAS No. 131. We examine this set of firms because they likely had the strongest incentives to withhold segment information and analysts potentially had the most to gain when these firms were forced to begin providing segment disclosures under SFAS No. 131. We find that these firms used the latitude in SFAS No. 14 to hide profitable segments operating in less competitive industries than their primary operations. However, we find no evidence to suggest that these firms used the latitude in SFAS No. 14 to mask poor performance. In contrast, our results suggest that by withholding segment information, these firms allowed themselves to appear as if they were underperforming their competition when this was not the case. Thus, their decision to withhold segment disclosures under SFAS No. 14 appears to be motivated by a desire to protect profits in less competitive industries. In terms of the impact of SFAS No. 131 on analysts' information environment, our evidence suggests that SFAS No. 131 increased analysts' reliance on public data, but we provide weak evidence to suggest that this shift may have come at the cost of a marginal increase in overall uncertainty and squared error in the mean forecast.

The authors benefited from the input of workshop participants at Cornell University and the 2004 American Accounting Association Annual Meeting. We also thank Sanjeev Bhojraj, Dave Farber, Charles Lee, Paul Hribar, Andy Leone, Richard Schneible, Doug Stevens, Bill Wempe, and our two anonymous reviewers for helpful comments. The authors gratefully acknowledge the contribution of I/B/E/S Inc. for providing earnings per share forecast data, available through the Institutional Brokers Estimate System and the financial support of the Noble Foundation and the David Eccles School of Business. These data have been provided as part of a broad academic program to encourage earnings expectation research.

Editor's note: This paper was accepted by Terry Shevlin, Senior Editor.

Submitted November 2003
Accepted November 2004

I. INTRODUCTION

In June 1997 the Financial Accounting Standards Board (FASB) issued SFAS No. 131, *Disclosures about Segments of an Enterprise and Related Information.* Effective for fiscal periods beginning after December 15, 1997, the standard requires public companies to provide information about their reportable operating segments as defined for internal decision-making, resource allocation, and performance assessment purposes. The preceding standard, SFAS No. 14, *Financial Reporting for Segments of a Business Enterprise,* required disclosure of disaggregated information by business and geographic segment, but allowed managers flexibility in identifying their reportable segments.

In part, SFAS No. 131 was a response to financial analysts' long-standing complaints that SFAS No. 14 allowed too much flexibility in defining reportable operating segments and that this flexibility was exploited by some firms to avoid providing segment disclosures (Knutson 1993; AICPA 1994; Pacter 1993). However, those opposed to the standard claimed that SFAS No. 131 disclosures would impose competitive costs on firms. This study sheds light on these issues by examining managers' motives to withhold information under SFAS No. 14 and the impact of SFAS No. 131 disclosures on analysts' information environment. We conduct this analysis on a sample of 615 firms that were self-proclaimed single-segment firms under SFAS No. 14, but initiated segment reporting under SFAS No. 131. Hereafter, we refer to these firms as the "change firms."

These firms are suited to our research question because, by virtue of their decision to withhold industry segment information pre-SFAS No. 131, they utilized the flexibility in SFAS No. 14 to the greatest extent possible, presumably because of perceived high disclosure costs. In addition, if analysts rely on private information in the absence of company-generated segment disclosures, the onset of public disclosure could impact analysts' relative reliance on private versus public information sources. If such changes occur, then we expect to observe changes in analyst consensus, uncertainty, and forecast error, following the adoption of SFAS No. 131.

During the SFAS No. 131 debate, competitive harm was raised as a significant cost associated with segment disclosures. Preparers argued that proprietary information such as revenue, pricing, and cost structure information by product line might be inferred from segment disclosures. We investigate this issue by examining whether newly reported segments operating in industries distinct from their firm's primary industry operate in competitive environments different from their firm's primary operations. Of the 615 firms included in our analysis, only 340 firms have at least one newly reported segment operating in an industry with a three-digit SIC code that differs from their firm's primary SIC code. Hereafter, we refer to these segments as "hidden segments" and use this subsample for our competitive environment analysis.

We compute a weighted average concentration ratio across each of the 340 firms' hidden segments using segment sales as the weight. We then compare this segment-based concentration ratio to the concentration ratio for the firms' primary industries. The median within-firm difference is significantly negative (p-value 0.0446).[1] Since competition decreases as concentration ratios increase, this indicates that the hidden segments generally operate in less competitive industries than their firm's primary industry. Moreover, we find the same result using two alternative measures of competitive environment: the Herfindahl index and the Harris (1998) Speed of Profit Adjustment measure. Accordingly, based on these results we conclude that firms used the flexibility afforded them by SFAS No. 14 to hide operations

---

[1] Due to the presence of outlying observations we focus on median values for all of our statistical tests.

in less competitive industries. This result confirms that of Harris (1998) who also finds managers are less likely to separately disclose operations in less competitive industries, using a sample of multi-segment firms and SFAS No. 14 data.

Managers with operations in less competitive industries may withhold segment information to protect profits, thereby mitigating the proprietary costs of disclosure. However, some allege that managers used the flexibility inherent in SFAS No. 14 to conceal poor performance. We conduct a variety of tests and find results consistent with firms using the flexibility afforded by SFAS No. 14 to mitigate proprietary costs and protect profits in less competitive industries rather than to conceal poor performance.

SFAS No. 131 is unique in that it is the first standard specifically targeted to addressing financial analysts' complaints. To investigate the impact of the new disclosures on analysts' information environment, we develop hypotheses concerning how the increase in public disclosure resulting from SFAS No. 131 might affect analysts' forecasts. We use the Barron et al. (1998) model that relates properties of analysts' information environments to properties of their forecasts to develop hypotheses and to estimate the effect of SFAS No. 131 on analysts' consensus, overall uncertainty, and squared error in the mean forecast.

We examine changes between 1997 and 1998 (the year before disclosure) and 1998 and 1999 (first year of disclosure) in analyst consensus, overall uncertainty, and squared error in the mean forecast. We rerun the analysis for a subset of firms with sufficient data through 2000 to determine if any observed changes are sustained in the near term. However, we lose one-fifth of our sample firms with I/B/E/S data when we move to the longer term, weakening the power of this analysis.

Coincident with the adoption of SFAS No. 131, we document a significant and sustained increase in consensus among the change firms' analysts. Since consensus captures analysts' relative reliance on public information versus the combined set of public and private information, an increase in consensus suggests increased reliance on public information. At the same time, we find some evidence of an increase in overall uncertainty among the change firms' analysts. These results suggest that analysts abandon a more costly, albeit more informative private information set, in favor of a less costly public information set. Reliance on this public information set increases consensus while abandoning the richer private information set increases uncertainty. However, when we rerun the uncertainty analysis for the subset of firms with data through 2000, we find no evidence of a change in overall uncertainty coincident with the adoption of SFAS No. 131. Accordingly, the latter result is sensitive to the set of firms examined.

In computing the mean forecast, the process of averaging across analysts' forecasts mitigates the impact of error in analysts' private information sets since this source of error is idiosyncratic. However, the process of averaging does not mitigate the impact of error in the analysts' public information set as this source of error is common to all analysts (Barron et al. 1998). As a result, it is possible for the magnitude of the error in the mean forecast to increase with increased reliance on public information. Coincident with the adoption of SFAS No. 131, we document a significant increase in the magnitude of the error in the mean forecast. However, when we rerun the analysis for the subset of firms with data through 2000, we find no evidence of a change in the magnitude of the error in the mean forecast coincident with the adoption of SFAS No. 131. Accordingly, this result is sensitive to the set of firms examined.

Section II provides a brief description of the evolution of SFAS No. 131 and outlines our research questions in the context of related research. Section III describes our empirical proxies, while Section IV lays out our sample selection procedures and provides descriptive statistics. Section V presents the results of our analyses. Finally, Section VI provides a brief summary and conclusions.

II. BACKGROUND AND HYPOTHESES DEVELOPMENT

SFAS No. 131 and SFAS No. 14

Prior research shows that the industry segment disclosures furnished by firms in compliance with SFAS No. 14 enhanced security valuation (Kinney 1971; Collins and Simonds 1979; Tse 1989) and improved analysts' earnings forecasts (Kinney 1971; Collins 1976; Baldwin 1984; Swaminathan 1991). This literature suggests that the information provided in compliance with SFAS No. 14 was useful to the capital markets. Even so, financial analysts and other users of financial reports maintain that SFAS No. 14 was inadequate in several respects (Knutson 1993). First, although encouraged, quarterly disclosure of segment information was not required under SFAS No. 14. The Association for Investment Management and Research (AIMR) and the American Institute of Certified Public Accountants (AICPA) claimed that quarterly disclosure of segment information was one of the most important improvements needed (Knutson 1993; AICPA 1994). Evidence in Botosan and Harris (2000) disputes the severity of this problem, however. They find that more than 60 percent of their sample firms disclosed quarterly segment data on a voluntary basis prior to 1987. Thus, analysts' complaints may have stemmed from extremely poor disclosures by a minority of firms. Other improvements requested by users included (1) a greater number of segments for some enterprises, (2) more information about segments, (3) a segment breakdown that corresponds with internal management reports, and (4) consistency of segment information with information provided in other parts of the annual report.

SFAS No. 131 was implemented to rectify these perceived inadequacies of SFAS No. 14. Specifically, SFAS No. 131 requires interim reporting of segment information. In addition, firms must identify industry segments for *external* reporting purposes in the same manner that management views operating segments for *internal* decision-making purposes. Also, firms are required to disclose information about each reportable segment that is similar to the information available to internal decision makers. Thus, firms may now choose their own definition of segment profit regardless of whether it is consistent with generally accepted accounting principles. As discussed below, this particular attribute of SFAS No. 131 complicates the analysis of segment-level profitability.

Related Literature

This paper examines managers' motives for withholding segment information under SFAS No. 14 and the impact of SFAS No. 131 disclosures on analysts' information environment. In this respect, it adds to a growing body of research that uses firms' segment reporting choices as a setting in which to address questions related to the costs and benefits of voluntary and mandatory disclosures. For example, Harris (1998) provides empirical evidence that competition affects managers' segment disclosure choices. Piotroski (1999) documents an association between voluntary increases in the number of reportable segments and capital market benefits. Finally, Botosan and Harris (2000) find that firms are more likely to voluntarily increase the frequency of their segment disclosures following declines in market liquidity and analyst consensus, presumably to mitigate increased information asymmetry among market participants. Each of these studies uses SFAS No. 14 data.

More recently several studies investigate questions pertaining to segment reporting under SFAS No. 131. Herrmann and Thomas (2000) examine the reporting behavior of a sample of firms drawn from the largest of the *Fortune* 500 following the advent of SFAS No. 131. They conclude that SFAS No. 131 improved segment reporting based on an assessment of changes in the number of reportable segments and the consistency between segment disclosures and the rest of the annual report. Street et al. (2000) find similar improvements for a sample of Global 1000 firms. In addition, 49 percent of the firms in their sample that reported no segment data under SFAS No. 14 initiated segment disclosures under SFAS No. 131. Both of these studies focus on how SFAS No. 131 impacted the segment disclosures firms provide; neither investigates managers' motives to withhold segment information or the impact of SFAS No. 131 adoption on analysts' information environment.

Existing studies examining the effect of SFAS No. 131 on the information environment include Berger and Hann (2003) (hereafter BH) and Venkataraman (2001). BH compare industry-based forecasts of revenue and earnings using SFAS No. 14 data, to forecasts using retroactively disclosed SFAS No. 131 data, in order to measure the new information provided by SFAS No. 131 disclosures. They find that differences in these forecasts are associated with analysts' forecasts and stock prices suggesting that analysts and market participants had access to some of the SFAS No. 131 data before it was reported. This is consistent with analysts and market participants relying on private sources of information for these data, in the absence of SFAS No. 131 disclosures.

At the same time, consistent with SFAS No. 131 providing new information, BH document a decline in analysts' forecast errors coincident with the adoption of SFAS No. 131. We also examine changes in forecast errors coincident with the adoption of SFAS No. 131, but in contrast to BH, we limit our sample to firms that initiated segment disclosure under SFAS No. 131. This may explain why our results differ.

Finally, BH provide evidence that SFAS No. 131 improved monitoring. They find that, relative to multi-segment firms, firms initiating segment disclosure under the new standard had a smaller diversification discount pre-SFAS No. 131, and higher discount post-SFAS No. 131. They conclude "the new standard is effective in inducing diversified firms to reveal previously 'hidden' information about the firm's diversification strategy and its resource transfers across segments" (BH 2003, 212).

Venkataraman (2001) uses the Barron et al. (1998) model to estimate the precision of public and private information and finds that the precision of public information and overall precision of information increased for firms that changed the number of segments they disclosed post-SFAS No. 131. In contrast, our analysis focuses on changes in analysts' relative reliance on public versus private information following the adoption of SFAS No. 131. Moreover, our sample is limited to firms initiating segment disclosures under SFAS No. 131, whereas the Venkataraman (2001) sample is not. In addition, Venkataraman (2001) does not investigate managers' motives to withhold segment information.

In summary, the research conducted to date indicates that the adoption of SFAS No. 131 resulted in a finer partitioning of firms' operating activities, a reduction in analyst forecast errors, and improved monitoring. Moreover, the extant evidence suggests that some of the information disclosed under SFAS No. 131 was obtainable prior to the requirement to disclose and that the precision of analysts' public and overall information set increased following SFAS No. 131.

We extend this research in several respects. First, we focus on firms that initiated segment disclosures in response to SFAS No. 131. This sample of firms is particularly interesting because the managers of these firms took maximum advantage of the flexibility inherent in SFAS No. 14 in defining their segments in order to avoid providing segment disclosures altogether. In contrast, much of the prior research employs samples more broadly defined to include firms whose segment disclosures changed following SFAS No. 131. Second, for our sample of initiating firms we examine both managers' motives for choosing to withhold segment disclosures prior to SFAS No. 131 and the impact of the initiation of disclosure on aspects of analysts' information environment not examined in prior research.

Research Questions

Our first set of research questions focus on managers' motives for withholding segment information under SFAS No. 14. Hayes and Lundholm's (1996) model of managers' voluntary decisions to report segment data predicts that managers protect excess profits from being diminished by competitors through nondisclosure. This implies less disclosure in less competitive industries if excess profits (i.e., monopoly profits) are more likely in such industries and if these profits are protected by nondisclosure. Using SFAS No. 14 data, Harris (1998) finds that, when choosing among operations in different industries, managers are less likely to disclose operations in less competitive industries, consistent with abnormal profits being more prevalent there and with disclosure costs, on average, being correspondingly higher. Since theoretical evidence suggests that managers mitigate competitive costs through nondisclosure and existing empirical evidence suggests such competitive costs are higher in less competitive industries, we use the retroactive data that became available following the adoption of SFAS No. 131 to test the following hypothesis (all hypotheses are stated in alternate form):

H1: The segment operations that firms concealed under SFAS No. 14 tended to operate in less competitive industries than the firm's primary industry.

The Hayes and Lundholm (1996) theory suggests that managers hide certain segments to protect profits. However, analysts and others complained that managers abused the latitude in SFAS No. 14 to conceal poor performance. Accordingly, we examine the following nondirectional hypothesis related to firm profit performance:

H2: The profit performance of firms that concealed segments under SFAS No. 14 was different from other firms in their industries.

Our second set of research questions concerns the effect of SFAS No. 131 on analysts' information environment. We use the Barron et al. (1998) model, which relates unobservable properties of analysts' information environments (e.g., overall uncertainty and consensus) to observable properties of their forecasts including forecast dispersion, squared error in the mean forecast, and the number of forecasts.

Barron et al. (1998) assume that analysts observe a public signal that is common to all analysts and a private signal that is unique to each individual analyst. They also assume that analysts' forecasts are unbiased and based only on their public and private signals. In this setting, Barron et al. (1998) demonstrate that analysts' overall uncertainty (V) is comprised of common uncertainty (C) arising from analysts' reliance on the public signal and idiosyncratic uncertainty (D) arising from each analyst's reliance on his or her private signal. This relationship is captured by Equation (1):

$$V = C + D. \tag{1}$$

Analyst consensus (ρ) is the ratio of common uncertainty to overall uncertainty. It captures analysts' relative reliance on public versus private information by measuring the proportion of total uncertainty that is common across analysts due to analysts' reliance on public information. This relationship is captured by Equation (2):

$$\rho = C/V. \tag{2}$$

Finally, squared error in the mean forecast (*SE*) fully reflects common uncertainty, but reflects only a fraction of idiosyncratic uncertainty. This result obtains because the process of averaging across *N* analyst forecasts has no effect on common uncertainty, but because uncertainty arising from analysts' reliance on private information is idiosyncratic, the effect of this uncertainty is diversified away in the mean forecast. This relationship is captured by Equation (3):

$$SE = C + D/N. \tag{3}$$

With the passage of SFAS No. 131 additional segment information became publicly available. Segment disclosures are considered by financial analysts to be vital to their work (Knutson 1993). In addition, SFAS No. 131 specifically targeted analysts' complaints about the prior standard. Accordingly, we expect analysts to reduce their reliance on costly private information, choosing instead to employ the public information made available with the introduction of SFAS No. 131. Consequently we examine the following hypothesis, which predicts an increase in consensus post-SFAS No. 131:

H3: There is a significant increase in analysts' forecast consensus following the introduction of SFAS No. 131 disclosures.

While the Barron et al. (1998) model formalizes the definition of overall uncertainty, it does not predict the effect of SFAS No. 131 on overall uncertainty. In our setting, analysts are likely to abandon more costly private information in favor of less costly public information. To the extent these information sets vary in informativeness two outcomes are possible. If the public information set is more informative than the private information previously obtained, overall uncertainty will decline. Alternatively, if the public information set is less informative, uncertainty may increase. Accordingly, we examine the following nondirectional hypotheses pertaining to overall uncertainty:

H4: There is a change in the level of analysts' overall uncertainty following the introduction of SFAS No. 131 disclosures.

Finally, because squared error in the mean forecast fully reflects common uncertainty, but only partially reflects idiosyncratic uncertainty, the impact of SFAS No. 131 on squared error in the mean forecast is not clear. If analysts reduce their reliance on costly private information in light of the availability of SFAS No. 131 disclosures, then the diversification effect associated with private information is sacrificed. If the SFAS No. 131 information is sufficiently precise to offset this loss, then squared error in the mean forecast may decline; if not, then it may increase. Consequently, we test the following nondirectional hypothesis pertaining to the impact of SFAS No. 131 adoption on squared error in the mean forecast:

H5: There is a change in the squared error in the mean forecast following the introduction of SFAS No. 131 disclosures.

III. RESEARCH DESIGN AND EMPIRICAL PROXIES

Proprietary Costs

We provide evidence on managers' motives to withhold segment information under SFAS No. 14 by examining the competitive environment of the change firms' hidden segments. We define industry in terms of the three-digit SIC assigned by Compustat and we use four-firm concentration ratios to measure competitive environment in our primary tests. We compute four-firm concentration ratios by taking the ratio of the sum of sales for the four largest firms in an industry to total industry sales. Our computations incorporate all firms included on the Compustat PST, Full Coverage, and Research tapes. As the market share held by the four largest firms increases, competition decreases; thus, concentration ratios are inversely related to the level of competition.

In supplementary analysis we use the Herfindahl index and the Harris (1998) Speed of Profit Adjustment metric to measure competitive environment. We estimate the Herfindahl index by summing the squared market share of all firms in an industry. The Herfindahl index is similar to the four-firm concentration ratio in that as it increases competition decreases. However, the Herfindahl index includes all firms in an industry not just the largest four.

We estimate Harris' measure of the speed of positive abnormal profit adjustment with the following regression:

$$X_{ijt} = \beta_{0j} + \beta_{1j}(D_n X_{ijt-1}) + \beta_{2j}(D_p X_{ijt-1}) + e_{ijt} \qquad (4)$$

where:

X_{ijt} = the difference between firm i's return on assets and the mean return on assets for its industry, j, in year t;
D_n = 1 if X_{ijt-1} is less than or equal to 0, and 0 otherwise; and
D_p = 1 if X_{ijt-1} is greater than 0, and 0 otherwise.

Equation (4) is estimated separately for each three-digit SIC using pooled cross-sectional time-series data for all firms in each industry. The coefficient β_{2j} reflects the persistence of return on assets above the mean in industry j. A significant positive coefficient indicates that firms earning above average profit rates are able to maintain this profit advantage over time; suggesting less competition.

Concentration ratios and the speed of profit adjustment reflect different aspects of competition. Both the four-firm concentration ratio and Herfindahl index reflect market share competition among firms within a single year. The speed of profit adjustment reflects competition for abnormal profits over time, regardless of firm size. Note that this measure is capable of capturing competition among a few large firms in a concentrated industry while the concentration ratios are not.

For the 340 firms that report segments in industries that differ from their primary industries (i.e., firms with hidden segments), we aggregate concentration ratios across the firms' hidden segments by computing a weighted average concentration ratio using segment size (segment sales) as the weights. We compare the concentration ratio for the firms' primary industries to the segment-based ratio to determine whether the hidden segments operated in more or less competitive industries than the firms' primary industries.[2] Evidence that the firm's hidden segments operate in less competitive industries is consistent with H1.

Firm Performance

Under SFAS No. 131 firms are allowed to define segment profit for external reporting in terms of the internal amounts used by corporate executives to evaluate segment profitability. As a result, many different definitions of profit appear in firms' SFAS No. 131 disclosures and in many instances it is extremely difficult to identify the definition of profit employed by a firm in preparing its segment disclosures.[3] Indeed, many of the concerns expressed by academics, regulators, and the business community in relation to "pro forma earnings" are equally applicable to the segment profit disclosures provided under SFAS No. 131. Moreover, many firms do not allocate selling, general, and administrative (SG&A) expenses to their segments producing unrealistically high profit margins at the segment level.

The multitude of profit definitions employed by firms and the ensuing difficulty we had identifying each firm's profit definition, combined with the bias induced by firms' decisions not to allocate SG&A expenses to their segments, make it difficult for us to assess profitability using reported segment profits. Accordingly, we employ segment sales and industry profit margins in our profit analysis as described below.

We undertake several comparisons to provide evidence on firm performance in the final fiscal years of SFAS No. 14 (1996 and 1997) and first fiscal year of SFAS No. 131 (1998). First, we assess the change firms' profit performance relative to a set of single-segment firms matched by three-digit SIC code, which continue to report as single-segment firms following the adoption of SFAS No. 131. Hereafter we refer to these firms as "no-change" firms. This comparison is relevant, because the change firms pooled with the no-change firms prior to SFAS No. 131 by virtue of the change firms' decision to withhold industry segment information. The no-change firms tend to be substantially smaller than the change firms, however, raising the possibility that differences in firm size confound our results. To address this issue, our second comparison assesses each change firm's profit performance relative to a firm matched by three-digit SIC code and sales. While the match firms are similar to the change firms in terms of size, they are fundamentally different in that the match firms did not use the flexibility afforded by SFAS No. 14 to the same extent as the change firms, perhaps because the nature of their operations did not afford them the flexibility to do so. Since both comparisons bring different advantages and disadvantages to bear, we believe that both are incrementally informative.

We examine the profitability of the change firms at both the firm-level and segment-level. We begin by assessing firm performance at the firm-level using benchmark measures of industry performance that were observable by market participants in real time. These comparisons assess how the change firms' profitability differs from that of other firms operating in the change firms' primary industries. The "other" firms used in this analysis are either the no-change firms or the match firm, but regardless, we estimate expected firm-level profit for the change firms by multiplying firm sales by an estimated industry net profit margin. For the analysis involving the no-change firms, our estimated industry net profit margin is the median net profit margin of the no-change firms, but for the analysis involving the match firm, we use the match firm's net profit margin. Finally, we estimate the change firms' unexpected profits, our test statistic, by taking the difference between the firms' reported and expected profits and scaling by their reported profits. These procedures produce two test statistics: one involving a comparison between the change and the median no-change firm, and the other involving a comparison between the change firms and their match firm.

---

[2] For example, InfoUSA's firm SIC is 7374; under the new standard they report segments in SICs 7331 and 7374. Thus, we compare the four-firm concentration ratio for the firm's primary industry, SIC 737, to the concentration ratio for SIC 733 (in this case, the weight is 1.0).

[3] We identified the following six profit definitions for our sample firms: earnings before interest and tax (57 percent), earnings before tax (12 percent), net income (12 percent), gross profit (11 percent), earnings before interest taxes, depreciation and/or amortization (5 percent), and earnings before discontinued operations and/or extraordinary items (3 percent). However, even these definitions were inconsistent across firms.

We also assess firm performance at the segment-level using benchmark measures of industry performance that were *not* observable by market participants in real time. Instead, these benchmark measures would have been observable only *if* the firm had provided segment disclosures. These comparisons assess how the change firms' profitability differs from that of other firms operating in the change firms' segments' industries. For purposes of this analysis we estimate expected segment-level profit for each of the change firms' segments by multiplying segment sales by the estimated industry net profit margin applicable to each segment. For purposes of the analysis involving the no-change firms, our estimated industry net profit margin is the median net profit margin of the no-change firms operating in the same three-digit SIC codes as the segments. For purposes of the analysis involving the match firm, our estimated industry net profit margin is the net profit margin of a match firm matched at the segment level on the basis of three-digit SIC code and sales.[4] Finally, we sum the segment-level expected profits to arrive at firm-level expected profits and compute firm-level unexpected profits, our test statistic, by taking the difference between the firms' reported and expected profits and scaling by their reported profits. This procedure produces two additional test statistics, one involving the no-change firms and the other involving the match firms.

On the one hand, finding that the change firms are less profitable than their competitors using the observable, firm-level benchmark, but are more profitable using the unobservable, segment-level benchmark is consistent with firms using the flexibility in SFAS No. 14 to conceal segment details that could be used by competitors to the detriment of the firm. Such a conclusion is also supported if we find that the change firms are more profitable than their competitors using both the observable and unobservable benchmarks. On the other hand, finding that the change firms are more profitable than their competitors, using the observable firm-level benchmark, but are less profitable using the unobservable segment-level benchmark, is consistent with firms using the flexibility in SFAS No. 14 to conceal poor performance. Such a conclusion is also supported if we find that the change firms appear less profitable than their competition using both the observable and unobservable benchmarks.

Consensus, Uncertainty, and Squared Error in the Mean Forecast

As stated in the hypothesis section of the paper, the Barron et al. (1998) model clarifies the relation between certain properties of analysts' information environment (overall uncertainty, V, and consensus, ρ) and properties of analysts' forecasts (forecast dispersion, D, squared error in the mean forecast, SE, and the number of forecasts, N). Using the relations describe by Equations (1) through (3) presented in the hypothesis section, Barron et al.

---

[4] Prior to performing the match we combine the sales of segments with the same three-digit SIC code. We identify the match firms based on the closest match to the combined sales figure and in so doing intentionally bias the matching process toward larger firms, thereby mitigating concerns of small-firm bias in the segment-level analysis.

(1998) express observable D and SE in terms of unobservable V and ρ. Barron et al. (1998) then reverse these expressions to specify unobservable V and ρ in terms of observable D, SE, and N, yielding the following equations, which we use to estimate V and ρ:

$$V = \left(1 - \frac{1}{N}\right)D + SE \tag{5}$$

$$\rho = \frac{SE - \frac{D}{N}}{\left(1 - \frac{1}{N}\right)D + SE} \tag{6}$$

where:

V = overall uncertainty;
D = forecast dispersion, measured as the sample variance of the individual forecasts;
SE = squared error in the mean forecast, measured as the difference between earnings per share and the mean forecast, i.e., $(\text{EPS} - \text{mean forecast})^2$;
ρ = analyst consensus; and
N = number of forecasts.

Using I/B/E/S one-quarter-ahead forecasts of quarterly earnings issued prior to each quarterly earnings announcement, we compute consensus, overall uncertainty, and squared error in the mean forecasts for each quarter beginning with January 1, 1997 and ending on December 31, 2000. We retain only the most recent forecast for each analyst for each quarter. We average the quarterly values of consensus, overall uncertainty, and squared error in the mean forecast across the four quarters within each year to arrive at average estimates for each firm year.

IV. SAMPLE SELECTION AND DESCRIPTION

Sample Selection

We begin our sample selection with the 5,114 firms reporting as single-segment firms in their 1996 annual report. We eliminate non-December year-end firms for consistency and to ease data collection because we hand-collect segment data for 1996 through 1998. Compustat does not report the 1996 and 1997 retroactive segment data the change firms disclosed in their 1998 financial statements. Accordingly, we hand-collect this segment data from the sample firms' 10-Ks and assign Compustat's 1998 segment SIC codes to the 1996 and 1997 retroactive segment data.

We examined footnote disclosures for each change firm to verify that SFAS No. 131 is the reason for initiating segment disclosure. We also compared the sum of our hand-collected segment sales data to consolidated sales data reported on Compustat. Due to concerns about data quality, we eliminated 16 firms for which the difference between these sales figures exceeds 10 percent. Also excluded from our final sample are firms whose SIC code places them in the banking, insurance, or utility industries. We exclude these firms because their disclosure behavior may be influenced by regulatory requirements.

Our final sample consists of 615, December year-end, change firms for which a 1998 10-K could be located and for which all other necessary data were available. For comparison purposes, we also identified 1,945 December year-end, no-change firms that report as single-segment firms before and after SFAS No. 131 and 615 match firms matched to the sample firms based on three-digit SIC code and sales. Since our profitability analysis involves comparisons at the segment-level as well as the firm-level, we also identify match firms for the segments based on segment three-digit SIC code and segment sales summed across segments with the same three-digit SIC code.

The sample firms operate in a wide variety of industries. Based on the firms' primary two-digit SIC codes, the most populated industry for the change and no-change firms is 73, which is business services. SIC 73 comprises 18.05 percent of the change firms and 14.81 percent of the no-change firms. In all, 41 two-digit SIC codes are represented in our final sample of change firms. Thus, our results are unlikely to be driven by any particular industry.

Consistent with findings in prior research, about 30 percent of the December year-end firms claiming single-segment status in 1996 began disclosing segment information under SFAS No. 131 (Berger and Hann 2003; Herrmann and Thomas 2000; Street et al. 2000). Thus, it appears that SFAS No. 131 has been effective in achieving the FASB's goal of increasing the number of reportable segments.

Sample Description

Descriptive statistics for the year ended 1998 are reported in Table 1. Panel A provides descriptive statistics pertaining to the number of segments reported by the change and match firms, and total sales and profit margin (earnings before extraordinary items/sales) for all three groups of firms. As shown, the mean (median) number of segments reported by firms forced to initiate segment disclosure with the adoption of SFAS No. 131 is 2.9 (3.0). By comparison, the number of segments reported by the match firms, most of which provided segment disclosures under SFAS No. 14, is slightly higher on average (3.2), but slightly lower at the median (2.0).

The median change firm has total sales of approximately $177 million in 1998. By construction, the median match firm's sales are close, albeit somewhat smaller, at $166 million. On a firm-by-firm basis (not tabled) the difference between the sales of each change firm and its match is approximately 3 percent of change firm sales at the mean, and 0.2 percent of change firm sales at the median. While these differences are statistically different from zero, economically the match on sales is quite close. In contrast, the no-change firm sample is comprised of relatively small firms. Median total sales of $55 million for the no-change sample is significantly less than the corresponding figure for the change firms.

Firm-level profit margin for the median change firms is 2.5 percent, whereas the corresponding figures for the match and no-change firms are 3.4 percent and 1.0 percent, respectively. A tail of observations with extremely negative profit margins characterizes all three samples. Due to the existence of these outlying observations our subsequent statistical analyses focus on tests of median values.

Table 1, Panel B describes the nature of the change firms' newly revealed segments. The mean (median) proportion of all newly disclosed segments operating in the same industry as the firm's primary industry is 72.98 percent (75.00 percent). This is consistent with the change firms claiming to operate in only one industry prior to SFAS No. 131. However, 340, or 55 percent, of the 615 change firms report segments in industries different from their firm's primary industry. Consistent with analysts' complaints, the mean (median) proportion of firm sales accounted for by these segments is 31.22 percent (23.45 percent). Since SFAS No. 14 required segment disclosure of operations that accounted for 10 percent or more of sales, assets, or profits, this evidence suggests these firms abused the "latitude" in the standard to avoid disclosure.

TABLE 1
Descriptive Statistics for 1998

Panel A: Firm-Level Descriptive Statistics

		Percentile					
Variable[a]	**Mean**	**1%**	**25%**	**50%**	**75%**	**99%**	**Standard Deviation**
Number of segments							
Change firms[b]	2.90	2.00	2.00	3.00	3.00	6.00	1.00
Match firms[c]	3.18	1.00	2.00	2.00	4.00	12.00	2.17
Total sales							
Change firms	1242.33	1.45	54.76	176.67	669.61	26273.00	4924.00
Match firms	913.50	1.42	52.98	165.92	605.88	8875.00	3506.00
No-change firms[d]	428.99	0.08	12.20	55.40	217.49	8814.27	1728.00
Profit margin							
Change firms	−0.218	−6.679	−0.041	0.025	0.072	0.400	1.438
Match firms	−0.147	−5.306	−0.042	0.034	0.078	0.489	1.017
No-change firms	−7.272	−53.029	−0.378	0.010	0.079	0.950	156.012

Panel B: Nature of Revealed Segments

	Mean	**Median**
Proportion of segments with same three-digit SIC as the firm's primary SIC	72.98%	75.00%
Proportion of firm sales accounted for by segments with a three-digit SIC different from the firm's primary SIC, n = 340	31.22%	23.45%

Panel C: Number of Segments Reported

	Change Firms		**Match Firms**	
	#	**%**	**#**	**%**
One	0	0.0	96	16.2
Two	260	42.3	212	35.8
Three	220	35.8	83	14.0
Four	87	14.1	83	14.0
Five	32	5.2	45	7.6
Six	15	2.4	28	4.7
Seven	1	0.2	21	3.6
Eight or more	0	0.0	24	4.1
Total firms	615	100.0	592	100.0

---

[a] Number of segments is the number of segments reported by the firm in 1998. Total sales are the dollar amount reported by the firm in its 1998 financial statements stated in millions of dollars. Profit margin is earnings before extraordinary items for the year ended 1998 scaled by total sales at the end of 1998.

[b] The change firm sample consists of 615 firms that reported as single-segments firms before the adoption of SFAS No. 131 and multi-segment firms after the adoption of SFAS No. 131.

[c] The match firm sample consists of 615 firms matched to the change firms on the basis of three-digit SIC code and sales. Twenty-three of these firms are not included on the Compustat Segment tape. As a result, the number of segment statistic quoted above is based on 592 observations.

[d] The no-change firm sample consists of 1,945 firms that reported as single-segment firms before and after the adoption of SFAS No. 131.

Table 1, Panel C reports the distribution of the number of new segments reported by the change firms and the number of segments reported by the match firms. The majority of the change firms, 42.3 percent, report only two segments. However a substantial proportion, 35.8 percent, reports three segments and 14.1 percent report four segments. Again this is consistent with some of the change firms abusing the flexibility allowed under SFAS No. 14 to provide significantly less disclosure than under SFAS No. 131. Less than 8 percent of the change firms report more than four segments. In contrast, at one extreme, 16 percent of the match firm sample consists of single-segment firms, while at the other extreme, 20 percent of the match firms report more than four segments.

V. EMPIRICAL RESULTS

Competitive Environment and Profit Performance

Table 2, Panel A suggests that the change firms' hidden segments operate in less competitive industries than their primary industries. For firms with hidden segments, n = 340, the mean (median) difference between the concentration ratio of the firms' primary industries and the weighted average concentration ratio of the hidden segments' industries is −0.006 (−0.012) with p-values of 0.67 (0.04). Since a smaller concentration ratio implies a more competitive environment, a negative value indicates that the firms' hidden segments operate in less competitive industries than the firms' primary industries. Although only significant at the median, the difference in firm and weighted average segment concentration ratios is negative for 56 percent of the firms indicating that for a majority of the firms their hidden segments operate in less competitive industries.

In supplementary analysis, not included in the tables, we examine two alternative measures of competitive environment: the Herfindahl ratio and the Harris (1998) Speed of Profit Adjustment (SPA) measure. The results obtained with the Herfindahl ratio are quite similar to those reported in the table. The change firms' hidden segments operate in less competitive industries than their firms' primary industries, but this result is significant only at the median (p-value 0.045). Stronger evidence consistent with H1 is documented with the SPA measure, however. Using this measure the hidden segments operate in less competitive industries than their firms' primary industries and this result is highly significant at both the mean and median (p-values of 0.0001 for both). Accordingly, based on the results of these three sets of analyses we conclude that firms withholding segment disclosures under SFAS No. 14 hid operations in less competitive industries, consistent with H1.

Panel B of Table 2 documents the results of our *firm-level* assessment of the profit performance of the change firms relative to the no-change and match firms. Recall that this benchmark would have been observable in real time. At the median, we find that the change firms' reported profits are significantly greater than the benchmark profits implied by the no-change firms' net profit margins, in all three years. However, we also find that the change firms' reported profits are significantly less at the median than the benchmark profits implied by the size and industry match firms' net profit margins, in all three years.

Panel C of Table 2 documents the results of our *segment-level* assessment of profit performance. Recall, that for this analysis we compute a benchmark measure of expected profit that could have been computed only *if* the firms had provided segment disclosures. At the median, we find that the change firms' reported profits are significantly greater than the expected profits implied by the net profit margins of the no-change firms operating in same industries as the change firms' segments. In addition, we find no difference between the change firms' profits and the expected profits implied by the net profit margins of the match firms operating in the same industries as the change firms segments.

TABLE 2
Analysis of Competitive Environment and Profit Performance
(p-values in parentheses)[a]

Panel A: Competitive Environment Analysis[b]

	1998	
	Mean	**Median**
Firm-by-firm difference between the firm's industry concentration ratio and the weighted-average concentration ratio of the segments' industries (computed as firm − weighted average segment)	−0.006	−0.012
	(0.6747)	(0.0446)

Panel B: Firm-Level Profitability Analysis[c]

	1996			1997			1998		
Comparison Set	**Mean**	**Median**	**#**	**Mean**	**Median**	**#**	**Mean**	**Median**	**#**
No-Change Firms	2.478	0.384	535	5.493	0.251	611	6.314	0.172	615
	(0.0114)	(0.0004)		(0.0026)	(0.0152)		(0.2079)	(0.0309)	
Match Firms	1.005	−0.038	535	−1.153	−0.121	611	−3.066	−0.150	615
	(0.2872)	(0.0195)		(0.2454)	(0.0228)		(0.1559)	(0.0351)	

Panel C: Segment-Level Profitability Analysis[d]

	1996			1997			1998		
Comparison Set	**Mean**	**Median**	**#**	**Mean**	**Median**	**#**	**Mean**	**Median**	**#**
No-Change Firms	2.625	0.426	535	5.208	0.296	611	9.720	0.184	615
	(0.0099)	(0.0001)		(0.0017)	(0.0002)		(0.0835)	(0.0004)	
Match Firms	−0.069	0.102	534	9.272	0.017	610	−0.505	0.115	612
	(0.8981)	(0.7396)		(0.2126)	(0.4276)		(0.7830)	(0.1159)	

---

[a] p-values in parentheses below the mean figures are from a two-tailed t-test. p-values in parentheses below the median figures are from a two-tailed signed rank test.

[b] Concentration is the four-firm industry concentration ratio computed using data from 1998 for all firms on Compustat. The figure in the table is the difference between industry concentration in the firm's primary SIC and a weighted average segment-based concentration ratio using segment sales as the weight. This analysis incorporates only those segments whose SIC codes differ from their firms' primary SIC code (340 firms).

[c] Firm-level profit performance: We estimate expected profit at the firm-level by multiplying the firm's sales by the industry profit margin associated with the firm's primary SIC code using one of two comparison sets: (1) the median no-change firm profit margin, or (2) the match firm profit margin. The figure quoted in the table is computed by taking the difference between the firm's reported profit and expected profit and scaling by reported profit.

[d] Segment-level profit performance: We estimate expected profit (ultimately at the firm-level) by multiplying each segment's sales by the industry profit margin associated with the segment's industry using one of two comparison sets: (1) the median no-change firm profit margin, or (2) the match firm profit margin with the match identified based on segment three-digit SIC code and segment sales. We sum across segments to arrive at firm-level expected profit. The figure quoted in the table is computed by taking the difference between the firm's reported profit and expected profit and scaling by reported profit.

Taken together, the results presented in Panels B and C of Table 2 suggest the following with respect to H2. First, it is clear from the analysis involving the match firms that by withholding segment disclosures, the change firms allowed themselves to appear as if they were underperforming their competition, when this was not the case. Moreover, relative to both the pre-SFAS No. 131 observable and unobservable benchmarks, the change firms outperformed the no-change firms in their industries in all three years. In neither case is the evidence consistent with the change firms withholding segment disclosures to hide poor performance. Finally, in supplementary analyses we re-analyze the data including only the 340 firms with hidden segments. The results of these analyses (not included in the tables) produce even stronger results consistent the conclusions drawn from Table 2, Panels B and C.

Overall, the results in Table 2 pertaining to both the competitive environment analysis and the profitability analysis, reveal a consistent and compelling story. That is, the change firms were motivated to exploit the flexibility inherent in SFAS No. 14 to protect profits from competitors, not to hide poor performance from the capital market. These results are consistent with abnormal profits being more likely, on average, in less competitive industries, and managers of firms that earn excess profits facing higher proprietary disclosure costs.

Effect on Financial Analysts

Table 3, Panel A presents the results of our analysis of changes in consensus, overall uncertainty, and error in the mean forecast for the change firms with forecast data on I/B/E/S. For comparison, Panel B presents the same information for the no-change firms with I/B/E/S data. For each variable we present both the value of the variable for the year and the change in its value from the preceding year.

We test our hypotheses pertaining to the changes in analysts' information environment in two ways. First, we compute within-firm year-to-year changes in consensus, overall uncertainty, and squared error in the mean forecast; p-values for differences from zero are reported in parentheses. Second, we compare the change experienced by the change firms to that experienced by the no-change firms; p-values for differences between groups are reported in square brackets. This latter comparison is conducted to control for changes in analysts' information environment unrelated to the adoption of SFAS No. 131, but if the initiation of segment disclosure by the change firms impacts the information environment of the no-change firms through information spillover effects, this analysis understates the effect of SFAS No. 131 on analysts' information environment.

We present results for two time horizons. The first incorporates levels and changes in analyst forecast properties for: (1) the year before segment data became available, i.e., between 1997 and 1998, and (2) the first year with segment data available, i.e., between 1998 and 1999. There are 327 change firms with sufficient I/B/E/S data to perform these computations. The second extends the time horizon to include the second year with segment data available, i.e., between 1999 and 2000. Fewer firms have I/B/E/S data for all years 1997–2000, reducing our sample size for the change firms to 258.[5] This latter analysis allows us to assess whether any changes in the forecast properties observed between 1998 and 1999 reverse in 2000, but at the cost of a reduced level of statistical power. Due to additional reductions in sample size, we do not extend our analysis beyond 2000.

---

[5] The sample size declines by similar amounts for both the change and no-change firms, 21 percent and 19 percent, respectively, when we require four consecutive years of I/B/E/S data. Accordingly, we do not believe this decline is indicative of any bias in the change sample.

TABLE 3
Effect of SFAS No. 131 Disclosures Available Beginning in 1998 on Financial Analysts
(p-values for difference from zero in parentheses)[a]
[p-values for test comparing the change and no-change firms][a]

	Two-Year Horizon			Three-Year Horizon			
	1997	1998	1999	1997	1998	1999	2000
Panel A: Change Firms							
Mean consensus[b]	0.587	0.553	0.605	0.575	0.556	0.614	0.600
Mean change in consensus[c]		−0.033	0.051		−0.019	0.059	−0.014
		(0.190)	(0.027)		(0.478)	(0.026)	(0.585)
		[0.487]	[0.028]		[0.562]	[0.020]	[0.139]
Mean overall uncertainty[b]	0.005	0.006	0.008	0.004	0.005	0.006	0.008
Mean change in overall uncertainty[c]		0.001	0.002		0.001	0.000	0.003
		(0.287)	(0.060)		(0.213)	(0.656)	(0.004)
		[0.557]	[0.124]		[0.642]	[0.184]	[0.649]
Squared error in the mean forecast[b]	0.004	0.004	0.007	0.003	0.004	0.005	0.007
Change in the squared error in the mean forecast[c]		0.001	0.002		0.001	0.001	0.002
		(0.445)	(0.043)		(0.408)	(0.389)	(0.021)
		[0.617]	[0.085]		[0.649]	[0.105]	[0.851]
Mean number of analysts	7.91	8.69	9.05	8.39	9.09	9.81	9.43
No. of firms	327	327	327	258	258	258	258

(*continued on next page*)

TABLE 3 (continued)

	Two-Year Horizon			Three-Year Horizon			
	1997	1998	1999	1997	1998	1999	2000
Panel B: No-Change Firms							
Mean consensus	0.606	0.595	0.574	0.608	0.608	0.581	0.615
Mean change in consensus		−0.012 (0.528)	−0.021 (0.288)		0.001 (0.979)	−0.027 (0.200)	0.034 (0.086)
Mean overall uncertainty	0.004	0.006	0.006	0.004	0.006	0.005	0.007
Mean change in overall uncertainty		0.001 (0.005)	0.000 (0.835)		0.002 (0.001)	−0.001 (0.084)	0.002 (0.001)
Squared error in the mean forecast	0.004	0.005	0.005	0.004	0.005	0.004	0.005
Change in the squared error in the mean forecast		0.001 (0.029)	0.000 (0.907)		0.001 (0.035)	−0.001 (0.103)	0.002 (0.007)
Average number of analysts	6.91	8.26	9.06	7.34	8.81	10.06	9.67
No. of firms	529	529	529	429	426	426	426

---

[a] p-values are two-sided except for change in consensus in 1999, which is one-sided due to our hypotheses.

[b] Consensus and overall uncertainty are measured with Equations (6) and (5), respectively. Squared error in the mean forecast is the square of earnings per share less the mean forecast, i.e., $(\text{EPS} - \text{mean forecast})^2$.

[c] SFAS No. 131 data became available for the first time in annual reports for years ending Dec. 31, 1998. Change amounts for the 1998 column are the difference between 1997 and 1998, the year before the SFAS No. 131 became available. Change amounts for the 1999 column are the difference between 1998 and 1999, the first year the SFAS No. 131 was available. Change amounts for the 2000 column are the difference between 1999 and 2000, the year after SFAS No. 131 data was available.

We document a significant increase in analyst forecast consensus for the change firms coincident with SFAS No. 131. As expected, between 1997 and 1998 (the year prior to the onset of disclosure) the mean change in consensus is not statistically significant. However, between 1998 and 1999 (the initial year of disclosure) consensus increases 0.051 (p-value = 0.027) from 0.553 to 0.605. In contrast, changes in consensus are not statistically significant for either year for the no-change firms (see Panel B of Table 3), even with a 60 percent larger sample size. The t-tests comparing the two groups indicate that the increase in consensus experienced by the change firms is statistically greater than the change in consensus experienced by the no-change firms (p-value of 0.028). Using a reduced sample of firms with forecasts in all four years from 1997 to 2000, we show that the increase in analyst forecast consensus is sustained through 2000 (the year following initial disclosure). Specifically, this subsample experiences a significant increase in consensus from 1998 to 1999 (p-value of 0.026), but an insignificant change in consensus both the year prior to initial disclosure, and the year after. Since consensus captures the amount of common information relative to total information impounded in analysts' forecasts, this increase suggests greater reliance on public information, consistent with H3. Overall, these results indicate that analysts responded to the change in their information environment by increasing their reliance on the public information that became available under SFAS No. 131.

Table 3, Panels A and B document mixed results from our analysis of changes in overall uncertainty around the introduction of SFAS No. 131. Consistent with H4, the data indicate no change in overall uncertainty for the change firms between 1997 and 1998 (the pre-SFAS No. 131 period), but a marginally significant increase in overall uncertainty between 1998 and 1999 (p-value of 0.060). In contrast, the no-change firms experience a significant increase in overall uncertainty the year before initial disclosure of segment information by the change firms, but experience no significant change in overall uncertainty in the year of disclosure. At the same time, analysis of the smaller sample for which we have a longer time-series of data, indicates no significant change in the change firms analysts' mean overall uncertainty until 2000 (the second year of disclosure), but significant changes in the no-change firms analysts' mean overall uncertainty in each year. Accordingly, we conclude that there is evidence of a marginal increase in overall uncertainty coincident with the adoption of SFAS No. 131, but this result is sensitive to the subset of firms examined.

Finally, Table 3, Panels A and B present the results of our analysis of changes in the squared error in the mean forecast (*SE*) around the adoption of SFAS No. 131. These results are similar to those discussed above pertaining to overall uncertainty. For the change firms, we document no significant change in the *SE* prior to adoption of SFAS No. 131, but a significant increase in the *SE* coincident with SFAS No. 131 adoption (p-value of 0.043). In contrast, the no-change firms experienced an increase in the *SE* the year prior to the adoption of SFAS No. 131, but no change in the *SE* in the year of adoption. These results are consistent with H5. However, using the smaller sample for the longer time horizon, we find no significant change in the change firm analysts' *SE* until 2000, whereas the no-change firm analysts' experienced significant increases in *SE* the year before and the year after adoption. Accordingly, we conclude that there is evidence of an increase in squared error in the mean forecast coincident with the adoption of SFAS No. 131, but this result is sensitive to the subset of firms examined.

VI. SUMMARY AND CONCLUSION

Using retroactive disclosures required by Statement of Financial Accounting Standards (SFAS) No. 131, we examine managers' incentives for withholding segment information under SFAS No. 14 and the impact of SFAS No. 131 on analysts' information environment for a sample of firms that previously reported as single-segment firms. We examine this set of firms because they likely had the strongest incentives to withhold segment information and analysts potentially had the most to gain when these firms were forced to begin providing segment disclosures under SFAS No. 131. Moreover, these firms epitomized analysts' complaints that some firms abused the latitude in SFAS No. 14 to avoid providing any segment disclosure. Thus, we believe this set of firms is well suited to the research questions we investigate.

Our study provides varying degrees of support for both sides of the debate surrounding SFAS No. 131. First, our results suggest that the managers of firms forced to initiate segment disclosures under SFAS No. 131 withheld segment information under SFAS No. 14 to protect profits in less competitive industries, not to conceal poor performance as some have alleged. This supports managers' claims regarding the proprietary costs of segment disclosure and does not support analysts' claims that managers concealed poor performance. Second, the majority of the firms initiating segment disclosures under SFAS No. 131 (55 percent) report segment operations in industries distinct from their firm's primary industry. The mean (median) percent of firm sales accounted for by these operations is 31.2 percent (23.5 percent), which is far in excess of the SFAS No. 14 requirement to report any segment accounting for 10 percent or more of sales, assets, or profits. This supports analysts' claims that multi-segment firms masqueraded as single-segment firms under SFAS No. 14. At the same time, 45 percent of the change firms report segments, all of which have the same three-digit SIC code as the firm's primary industry. Thus, even though these change firms now report segment data, the data provided pertains to activities in a single-industry classification, providing limited cross-industry variation among the newly reported segments. Finally, our evidence suggests that while SFAS No. 131 encourages greater reliance on public information (presumably due to lower information acquisition costs), overall uncertainty and the magnitude of the error in the mean forecast also increased marginally for the change firms. These results suggest that the analysts' shift to greater reliance on public information came at a cost in terms of forecast accuracy. However, these results are sensitive to the set of firms examined.

REFERENCES

American Institute of Certified Public Accountants (AICPA), Special Committee on Financial Reporting. 1994. *Improving Business Reporting—A Customer Focus.* Jersey City, NJ: AICPA.

Baldwin, B. 1984. Segment earnings disclosure and the ability of security analysts to forecast earnings per share. *The Accounting Review* (July): 376–389.

Barron, O., O. Kim, S. Lim, and D. Stevens. 1998. Using analysts' forecasts to measure properties of analysts' information environment. *The Accounting Review* 74 (October): 421–433.

Berger, P. G., and R. Hann. 2003. The impact of SFAS No. 131 on information and monitoring. *Journal of Accounting Research* (Supplement): 163–224.

Botosan, C., and M. Harris. 2000. Motivations for changes in disclosure frequency and its consequences: An examination of voluntary quarterly segment disclosures. *Journal of Accounting Research* 38 (Autumn): 329–354.

Collins, D. 1976. Predicting earnings with sub-entity data: Some further evidence. *Journal of Accounting Research* (Spring): 163–177.

———, and R. Simonds. 1979. SEC line-of-business disclosure and market risk adjustments. *Journal of Accounting Research* (Autumn): 352–383.

Financial Accounting Standards Board (FASB). 1975. *Financial Reporting for Segments of a Business Enterprise.* Statement of Financial Accounting Standards No. 14. Stamford, CT: FASB.

P28981

———. 1997. *Disclosures About Segments of an Enterprise and Related Information.* Statement of Financial Accounting Standards No. 131. Stamford, CT: FASB.

Harris, M. 1998. The association between competition and managers' business segment reporting choices. *Journal of Accounting Research* (Spring): 111–128.

Hayes, R., and R. Lundholm. 1996. Segment reporting to the capital market in the presence of a competitor. *Journal of Accounting Research* (Autumn): 261–279.

Herrmann D., and W. Thomas. 2000. An analysis of segment disclosures under SFAS No. 131 and SFAS No. 14. *Accounting Horizons* (September): 287–302.

Kinney, W. Jr. 1971. Predicting earnings: Entity versus sub-entity data. *Journal of Accounting Research* (Spring): 127–136.

Knutson, P. 1993. *Financial Reporting in the 1990s and Beyond.* A position paper of the Association for Investment Management and Research. Charlottesville, VA: Association for Investment Management and Research.

Pacter, P. 1993. *Reporting Disaggregated Information.* Financial Accounting Series Research Report. Norwalk, CT: FASB.

Piotroski, J. 1999. The impact of newly reported segment information on market expectations and stock prices. Working paper, University of Chicago.

Street, D., N. Nicols, and S. Gray 2000. Segment disclosures under SFAS No. 131: Has business segment reporting improved? *Accounting Horizons* (September): 259–285.

Swaminathan, S. 1991. The impact of SEC mandated segment data on price variability and divergence of beliefs. *The Accounting Review* (January): 23–41.

Tse, S. 1989. Attributes of industry, industry segment, and firm-specific information in security valuation. *Contemporary Accounting Research* 5: 592–614.

Venkataraman, R. 2001. The impact of SFAS 131 on financial analysts' information environment. Working paper, Pennsylvania State University.

THE ACCOUNTING REVIEW
Vol. 80, No. 3
2005
pp. 773–804

The Impact of SFAS No. 131 Business Segment Data on the Market's Ability to Anticipate Future Earnings

Michael L. Ettredge
University of Kansas

Soo Young Kwon
Korea University

David B. Smith
Iowa State University and Securities Exchange Commission

Paul A. Zarowin
New York University

ABSTRACT: This study investigates the effect of firms' adoption of SFAS No. 131 segment disclosure rules on the stock market's ability to predict the firms' earnings, as captured by the forward earnings response coefficient (FERC). The FERC is the association between current-year returns and next-year earnings. SFAS No. 131, effective for fiscal years beginning after December 15, 1997, arguably increased both the quantity and quality of segment disclosure. Consistent with the standard's intended qualitative effects, pre-131 multi-segment firms experienced a significant increase in FERC after adopting SFAS No. 131. Consistent with the standard's intended quantitative effects, many pre-131 single-segment firms began disclosing multiple segments, and those that did experienced an increase in FERC. However, pre-131 single-segment firms that remained single segment (i.e., were unaffected by SFAS No. 131) had no change in FERC, indicating that the increase in FERC for 131-affected firms is not due to some other event concurrent to the adoption of SFAS No. 131. These results are robust under numerous procedures that control for characteristics of the sample firms and their earnings, providing strong evidence that SFAS No. 131 resulted in an increase in stock price informativeness for affected firms. Thus, we provide the first empirical price-based evidence that SFAS No. 131 provided more information (about future earnings) to the market, as the standard's proponents have suggested.

Keywords: *SFAS No. 131; segment reporting; forward earnings response coefficient.*

We thank participants at the University of Michigan Law School's Share Price Accuracy Conference, Georgia State University, the University of Kansas School of Business workshop, the editor, and two anonymous reviewers.

Editor's note: This paper was accepted by Terry Shevlin, Senior Editor.

Submitted November 2003
Accepted January 2005

I. INTRODUCTION

In this paper, we examine whether firms' adoption of the segment disclosure requirements contained in SFAS No. 131 is associated with an increase in the stock market's ability to predict the firms' future earnings.[1] We do so by investigating the association between current-year stock returns and next-year corporate earnings, for three-year periods both before and after adoption of SFAS No. 131. We use multiple-year *pre* and *post* periods to increase the power of our tests and to minimize the effect that any one year's (possibly unrepresentative) data might have on our results.

Our investigation is consistent with normative standard-setting guidelines (the FASB's *Conceptual Framework*), and is also important because the effects of mandated accounting changes on stock prices' ability to predict firms' future earnings are largely unknown. If mandated accounting changes cause more information to be reflected in stock prices, then they likely improve resource allocation.[2] This is particularly true in the case of business segment reporting, since these disclosures potentially improve resource allocation both in financial and product markets. Yet no research has examined the consequences of *any* mandated accounting change in terms of its effects on the amount of information (about future fundamentals) reflected in stock prices. Thus, this paper represents a new approach to studying the effect of SFAS No. 131.

Adoption of SFAS No. 131 is a particularly interesting accounting method change because segment disclosures are integral to the investment analysis process (Knutson 1993, 59).[3] Financial analysts and other users generally favor finer segment information. Corporate-level managers, however, have incentives to conceal a firm's sources of profitability from competitors, with incentives to conceal being greatest for firms with high corporate-level profits and facing powerful competitors (Ettredge et al. 2002). SFAS No. 131 arguably reduced managers' ability to conceal information about segment profitability (Ettredge et al. 2004). This should increase the market's ability to predict future corporate-level cash flows and earnings. Berger and Hann (2003) and Venkataraman (2001) provide evidence that analysts' forecast accuracy increased after SFAS No. 131 became effective. This paper extends prior research by employing a price-based metric for the market's ability to predict firms' future earnings. This metric enables us to investigate the effect of SFAS No. 131 adoption on the "informativeness" (about future annual corporate earnings) of segment data, both for larger, well-covered firms like those studied by Venkataraman (2001) and by Berger and Hann (2003), as well as for smaller firms that have not been studied by prior research. Since many smaller firms experienced the same disclosure changes as larger firms and since smaller firms are known to have a poorer information environment to begin with (Atiase 1985; El-Gazzar 1998), smaller firms are potentially the group most affected by the new segment reporting rules.

Our proxy for the stock market's ability to predict firms' future earnings is the future earnings response coefficient, FERC. This coefficient is obtained by regressing current year stock returns against next year corporate annual earnings plus control variables. *Ceteris*

---

[1] Statement of Financial Accounting Standards (SFAS) No. 131, *Disclosure about Segments of an Enterprise and Related Information* (FASB 1997), became effective for fiscal years beginning after December 15, 1997. It superceded SFAS No. 14, *Financial Reporting for Segments of Business Enterprises* (FASB 1975).

[2] Tobin (1982) refers to this as functional efficiency. Durnev et al. (2003) discuss the link between informational efficiency and functional efficiency. The FASB states that a goal of financial reporting is to enhance "[t]he effectiveness of individuals, enterprises, markets, and government in allocating scarce resources among competing uses [by assisting them] in evaluating alternative courses of action and the expected returns, costs, and risks of each" (FASB, 1985, SFAC No. 1, para. 16).

[3] In Appendix A of the exposure draft preceding SFAS No. 131, the FASB (1996) quotes Knutson (1993, 59) to justify the need for a new business segment standard.

paribus, a disclosure regime that better enables investors to predict future earnings will result in stock prices that better anticipate future earnings, and thus will result in higher FERCs. Our tests are based on those in Gelb and Zarowin (2002) and Lundholm and Myers (2002), who relate measures of voluntary corporate disclosure to the FERC. In their case, the disclosure metric is based on AIMR analysts' rankings. In our case, the disclosure metric is based on the business segment reporting regime, SFAS No. 14 or SFAS No. 131. A positive shift in FERC coincident with rule change suggests that SFAS No. 131 operating units are better measures of (future) profitability than are SFAS No. 14 industry groupings; i.e., the new rule results in financial data that better enable investors to predict future earnings.

We regress current returns against future earnings for a sample of firms likely affected by SFAS No. 131, for a *pre* period, December 1995–November 1998, and a *post* period, December 1999–November 2002, surrounding the implementation of the rule, which became effective for fiscal years beginning after December 15, 1997. We define firms that disclosed multiple segments in any of these years as likely affected by SFAS No. 131. In order to ensure that any changes in the returns-earnings relation for these firms are due to SFAS No. 131, and not to other changes that occurred during this period, we also estimate the same regressions for a control sample of firms likely unaffected by SFAS No. 131. We define firms that were likely not affected by SFAS No. 131 as those disclosing single segments in every year of the *pre* and *post* periods for which observations are available. For each group, we compare the coefficients on the future earnings between the *pre* and *post* periods. We find that firms likely affected by SFAS No. 131 experienced a positive and significant increase in FERC, while firms likely not affected by SFAS No. 131 did not. Consistent with a prime intent of the new standard, many pre-SFAS No. 131 single-segment firms disaggregated (i.e., became multi-segment under SFAS No. 131), and this coincided with a positive and significant increase in FERC. The FERC of *pre* multi-segment firms also increased, even for those that did not increase their number of disclosed segments. Such FERC increases likely are due to qualitative improvements in their segment disclosures. These results are robust to various alternative procedures, such as the inclusion of control variables and the use of different measures of segment disaggregation. This is the first empirical evidence that a mandated accounting change is associated with an increase in the ability of stock prices to anticipate future earnings.

The rest of the paper is organized as follows. Section II presents background information on business segment reporting and the anticipated effect of SFAS No. 131 on the market's ability to predict future earnings. Section III reviews relevant prior research on business segment reporting. Sections IV and V discuss the test methodology and the sample. Section VI reports the results of the primary empirical tests. Section VII reports the results of robustness tests. Section VIII concludes.

II. BACKGROUND ON BUSINESS SEGMENT REPORTING

SFAS No. 131 is intended to help investors better understand an enterprise's performance, and better assess future net cash flows, in order to make more informed judgments about the enterprise as a whole. Although these objectives differ little from those of SFAS No. 14, the underlying guidance regarding how segments must be defined is very different.

SFAS No. 14 required annual Form 10-K disclosure of sub-corporate-level information about: (1) the enterprise's operations in different industries; (2) its foreign operations and export sales; and (3) its major customers (SFAS No. 14, para. 3). Information provided included segment revenue, operating profit, and identifiable assets (SFAS No. 14, paras. 31–38). SFAS No. 14 required the "industry" method of defining business segments. To provide information about operations in different industries, managers grouped products and services into business segments that were significant in size for the company as a whole, using an industry classification scheme such as the Standard Industry Classification (SIC) system (SFAS No. 14, paras. 11–12). SFAS No. 14 also required that a company's profit centers be used as starting points for developing the company's business segments (SFAS No. 14, para. 13). In practice, however, managers normally developed product and service groupings into segments independently of the company's internal organization, and sometimes independently of the company's products and services. SFAS No. 14 therefore resulted in firms that provided information about segments defined as lines-of-business, and information about segments defined as geographic regions, with no way to link the two types of information. Another result of SFAS No. 14's approach to defining segments was that disclosed segments did not correspond to the internal organization of the company. Thus information about performance at the sub-corporate level often was noncomparable across different items in the Form 10-K (Hermann and Thomas 2000, 288).

SFAS No. 131's "management" method arguably reduced management's latitude for defining business segments. The new standard requires firms to define business segments that correspond to the way the business is managed. Operating segment results are defined as those results that are regularly reviewed by the enterprise's chief operating decision maker to make decisions about resources to be allocated to the segment, and to assess its performance. An operating segment under SFAS No. 131 is an administrative component of an enterprise (SFAS No. 131, para. 10). One result of SFAS No. 131 is that a firm's external auditors have access to more objective criteria (the firm's organizational structure) for determining whether the firm's business segments are defined appropriately.

The FASB intended that SFAS No. 131's management method of defining segments provide a direct link between segment disclosures and the way managers operate their businesses. This means that SFAS No. 131's segment footnote information should be more closely aligned with other information managers provide about the firm's various operations, than was the case under SFAS No. 14. To the extent companies previously (under SFAS No. 14) hid the profitability of subunits, by aggregating segment information into industry groupings rather than operating units, SFAS No. 131 should provide segment disclosures that better enable users to assess a company's future earnings and cash flows.

III. REVIEW OF RELEVANT ACADEMIC LITERATURE

This section discusses prior and concurrent studies of the prospective or actual effects of SFAS No. 131.

Maines et al. (1997) examine whether the industry approach to defining segments (per SFAS No. 14) and the management approach (per SFAS No. 131) have different effects on analysts' judgments and decisions. They find that a sample of financial analysts believe segment data to be more reliable when segments are defined using the SFAS No. 131 approach, where there is greater congruity of internal segment reporting with external segment reporting.

Street et al. (2000) find that the number of reported segments increased for a significant portion of the companies in their sample. They also find that segmental disclosures under SFAS No. 131 tend to be more consistent with the Management Discussion and Analysis disclosures than they were under SFAS No. 14. Herrmann and Thomas (2000) support the finding that companies tend to increase the reported number of segments after adopting SFAS No. 131. They also find that companies are disclosing more information items for each segment.

Venkataraman (2001) argues that although segment information reported under SFAS No. 131 differs from that reported under SFAS No. 14, it is not clear *ex ante* that the new information is superior, since SFAS No. 14 segment information had favorable characteristics. Disaggregation into segments based on products and services (the "industry" approach) is easily understood by investors, and can be compared with industry statistics compiled by government agencies. Unlike SFAS No. 131 segment data, SFAS No. 14 required that segment data be reported consistent with GAAP. Furthermore Venkataraman (2001) argues, based on the analytical literature of Kim and Verrecchia (1991, 1994), that changes in precision of mandated public disclosures can affect investors' incentives to acquire private information. As a result, the effect of SFAS No. 131 adoption on accuracy of analysts' forecasts, and on stock prices, is an empirical question. Using a sample of firms covered both by the I/B/E/S database and by Compustat's Segment database, he finds that average individual analyst forecast accuracy improves most for firms that change their reported segments when adopting SFAS No. 131. Furthermore, the change in a proxy for precision of private information is associated with the change in precision of public information. After controlling for change in precision of private information, Venkataraman (2001) finds only a weak association between improved accuracy of analysts' forecasts and changed reporting of segments by firms adopting SFAS No. 131. In summary he finds that the combined effects of SFAS No. 131 on investors' information acquisition activities, and on firms' segment disclosures, result in improved accuracy of analysts' forecasts. He does not investigate the effects of SFAS No. 131 on firms not well followed by analysts, or on stock prices.

Using data from 1994–2000, Ettredge et al. (2004) investigate the variability of segment profits, both pre- and post-SFAS No. 131. They find that firms whose managers have greater ability and competitive incentives to conceal the sources of firm-level profits, report less variable segment profits, consistent with proprietary costs of disclosure. In contrast, firms relying heavily on external financing voluntarily disclose more variability. Since 1997, SFAS No. 131 appears to have increased the transparency of multi-segment firms' profits, by increasing variability of reported segment profits.

Berger and Hann (2003) (hereafter B&H) examine firms' segment data in 10-Ks filed in the year when SFAS No. 131 was adopted. These data include the prior year's segment data, restated as if SFAS No. 131 had been in effect. They compare the retrospective SFAS No. 131 data with the SFAS No. 14 segment data originally reported in the prior year, to gain detailed insight into the effects of SFAS No. 131 on publicly available segment data. They find that SFAS No. 131 generally was accompanied by increases in numbers of segments disclosed, and in two other measures of segment reporting disaggregation. They find that analysts' one-year-ahead earnings forecasts, made during the final year before firms adopted SFAS No. 131, appear to incorporate private access to the types of segment information that SFAS No. 131 subsequently required to be disclosed. B&H also find that analysts' earnings forecast accuracy generally increases for multi-segment firms under SFAS No. 131. This suggests that not all the segment data provided by SFAS No. 131 were available privately under SFAS No. 14. B&H provide additional, return-based evidence that stock prices, in the year prior to adoption of SFAS No. 131, did not reflect all the SFAS No. 131 data subsequently disclosed for that year. Finally, the authors find that a measure of the stock market's discounting of the values of diversified firms increased under SFAS No. 131. This suggests that the new standard provides the market with incremental information about agency problems inherent in diversification.

In summary, prior and concurrent studies of the effects of SFAS No. 131 suggest that analysts and investors find the current reporting regime provides more reliable segment data, more disaggregated segment data, and segment data that better enable analysts to predict future earnings. However, these studies are limited to large firms well covered by analysts and to the year following SFAS No. 131's effective date. Many firms affected by the new standard were small, previously single-segment firms that are likely not well covered by analysts, and thus have a relatively poor information environment. Thus, our study examines SFAS No. 131's consequences on a more comprehensive firm sample as well as over a more extended period of time than studied by prior research. In particular, using both large and small firms allows us to investigate whether the information benefits implied by B&H for large, widely covered firms also apply to small firms. If increased FERCs are observed for small firms, then this suggests that SFAS No. 131's information benefits are not limited to firms with rich information environments (large and/or well covered by analysts); instead, these benefits pertain to all firms, regardless of size and/or analyst coverage.

Most importantly, we use a methodology that tests a key implication of past research: whether current-year stock returns better anticipate next-year earnings under SFAS No. 131. From a capital markets' perspective, knowing whether returns reflect more information about future earnings after SFAS No. 131 is the crucial issue, since making more information available to the market was the primary intent of the standard.[4] We turn now to a detailed discussion of our research method.

IV. THE MEASURE OF STOCK PRICE INFORMATIVENESS

Our stock price "informativeness" measure (how much information about future earnings or cash flows is capitalized into price) is based on Collins et al. (1994) (hereafter CKSS). CKSS assume revisions in expected dividends to be correlated with revisions in expected earnings, which allows them to express current stock returns as a function of the current period's unexpected earnings and (discounted) changes in expected future earnings. Of course, the expectations imbedded in the returns are unobservable. Consistent with the evidence cited above, incremental and improved business segment data should improve the market's ability to forecast future earnings in the post-SFAS No. 131 period. The goal of this paper is to see whether the market's future earnings expectations, as implied in stock returns, became closer to future earnings realizations for segment-reporting firms after adoption of SFAS No. 131; i.e., whether SFAS No. 131 resulted in current returns that are more highly associated with future earnings. CKSS proxy for current unexpected earnings using observed current change in earnings, and for changes in expected future earnings using changes in reported future earnings, resulting in a regression of current annual stock returns, R_t on current and future annual earnings changes (firm subscripts omitted):[5]

$$R_t = \mathrm{a} + \beta_0 \, \Delta E_t + \beta_1 \, \Delta E_{t+1} + \mathrm{u}_t \tag{1}$$

where the earnings variables are in per-share form and are scaled by the share price at the beginning of the current year, and the stock returns are total annual stock returns (measured over the period from nine months prior to fiscal year end to three months after fiscal year end).

---

[4] We also extend Berger and Hann (2003) because they focus entirely on line of business segment information, while our approach captures improved precision of earnings estimates due to *any* requirement of SFAS No. 131, including disclosure of segments defined either as lines of business or geographic segments.

[5] We show only one future year for ease of exposition. Liu and Thomas (2000) estimate a model similar to Equation (1) using analysts' forecasts as proxies for market expectations. We use actual future earnings as the regressors and not analysts' forecasts, because we want to know how much information about future earnings is reflected in current returns (i.e., how close future earnings realizations are to the unobservable expectations implicit in stock prices).

Using earnings changes as explanatory variables assumes that earnings follow a random walk. Rather than impose this condition, we follow Lundholm and Myers (2002) and estimate the levels form of the regression:

$$R_t = \mathrm{a} + \mathrm{b}_0 E_{t-1} + \mathrm{b}_1 E_t + \mathrm{b}_2 E_{t+1} + \mathrm{u}_t. \tag{2}$$

Viewed as of time t, variables E_{t-1}, E_t, and E_{t+1} represent scaled prior period EPS, current period EPS, and realized next period EPS, respectively. As Lundholm and Myers (2002) note, model (2) allows the random walk as a special case, if $\mathrm{b}_0 = -\mathrm{b}_1$.[6] In model (2), b_2 is the future earnings response coefficient, FERC, and is hypothesized to be positive; b_1, often referred to as the contemporaneous ERC, is also hypothesized to be positive, and b_0 is hypothesized to be negative.

CKSS argue that using the actual future earnings introduces an error-in-variables bias into estimates of the future earnings response coefficients, since the theoretically correct regressor is the unobservable expected future earnings. To help mitigate the errors in variables bias, we follow CKSS and include the future (next period) return, R_{t+1}, as a control variable in the model:

$$R_t = \mathrm{a} + \mathrm{b}_0 E_{t-1} + \mathrm{b}_1 E_t + \mathrm{b}_2 E_{t+1} + \mathrm{b}_3 R_{t+1} + \mathrm{u}_t. \tag{3}$$

As CKSS discuss, the hypothesized coefficient on R_{t+1} is negative (even if returns are univariately intertemporally uncorrelated), because R_{t+1} is correlated with the unexpected component of E_{t+1}.

Because their goal is to maximize the R^2 of the returns-earnings model, CKSS include three future years of earnings and returns in their regression. Our goal is to test whether the future response coefficient changed for firms affected by SFAS No. 131. Since our goal is not to maximize R^2, and since including more future years effectively reduces the already short time series, we include only one future year in our regression. Using a one-year horizon is also consistent with analysts, who focus on forecasting next year's earnings. Furthermore, since longer horizon earnings are harder to forecast, if there is a change in the future response coefficient related to SFAS No. 131, it is most likely to be detectable for the nearest year.

The goal of this paper is to determine whether current returns became more highly associated with future earnings for firms affected by SFAS No. 131, so we estimate Equation (3) using pooled data before (*pre*) versus after (*post*) the enactment of SFAS No. 131. The *pre* and *post* periods span 1995–1998 and 1999–2002, respectively, and are defined as follows:

pre = fiscal year-ends of December 1995 through November 1998; and
post = fiscal year-ends of December 1999 through November 2002.

The beginning of the *post* period is chosen to ensure that Form 10-Ks containing segment data reported under SFAS No. 131 are reflected in annual return periods (as defined) for the first fiscal year classified as post-131.[7] Fiscal years ending between the *pre* and *post* periods (December 1998 through November 1999) are omitted to avoid the potential confounding effect of early adoption, or of actions taken in preparation for adoption. We use multiple-year *pre* and *post* periods to increase the power of our tests and to minimize the effect that any one year's (possibly unrepresentative) data might have on our results.

---

[6] The more mean reverting earnings are, the smaller (in absolute value) is b_0 relative to b_1. This can be seen by rewriting Equation (2) with $\mathrm{b}_1(E_t - \varepsilon E_{t-1})$ where $\varepsilon = -\mathrm{b}_0/\mathrm{b}_1$.

Our null hypothesis is:

b_2 (*post*) = b_2 (*pre*), where *PRE* and *POST* designate the pre-131 period and the post-131 period.

Our alternative hypothesis is:

b_2 (*post*) > b_2 (*pre*). Rejection of the null hypothesis in favor of the alternative implies that SFAS No. 131 increased stock price informativeness.

A fundamental difference between our paper and other papers that have examined stock price informativeness is that we are testing for an intertemporal shift in FERC, due to a mandatory accounting change. Previous papers examine the cross-sectional variation in FERC, based on certain firm characteristics.[8] Since we are examining the effects of a mandatory accounting change, we are not subject to a selection bias that affects studies of voluntary accounting choices. However, since we are testing for an aggregate shift, we must control for other macro effects that could have caused changes in the returns-earnings relation, so that we can be confident that any change we do find can be attributed to SFAS No. 131. To control for such effects, we use a control sample of firms that likely are unaffected by SFAS No. 131. These are firms that disclose only single segments in the *pre* and *post* periods. If SFAS No. 131 caused multi-segment firms to provide more information that better enables the market to predict their future earnings, then we expect to reject the null hypothesis (not reject the null) that b_2 (*post*) = b_2 (*pre*), for samples of firms likely affected (unaffected) by SFAS No. 131. Thus, we estimate model (3) separately for single-segment firms and for SFAS No. 131-affected firms using data pooled over the *pre-* and *post-*periods using a dichotomous variable, *POST*, defined as 1 in the post-131 period, and as 0 in the pre-131 period.

It is important to point out that SFAS No. 131, by requiring firms to define segments using the management method, might reduce comparability among companies' segment disclosures, when contrasted with SFAS No. 14's definitions based on industry lines. This reduction in comparability could tend to reduce investors' ability to predict future earnings. Thus, the effect of SFAS No. 131 on FERC is by no means a foregone conclusion.

V. SAMPLE AND DATA

Our sample selection process, documented in Panel A of Table 1, begins with 14,112 listed firms covered by the 2002 Compustat Industrial Annual File for any year from 1995–

---

[7] Consider, for example, a calendar year firm that adopts SFAS No. 131 for the year beginning January 1, 1998. The first Form 10-K containing segment data reported under SFAS No. 131 might be filed as late as March 1999, or even later. Recall that annual returns are measured over the period from nine months prior to a fiscal year end to three months after a fiscal year end. The first annual return period for which we can be certain that SFAS No. 131 data are available to investors would be from April 1999 through March 2000. Thus the *POST* period for a calendar year firm begins with the fiscal year ended December 1999, not 1998.

[8] Other recent papers examining informativeness are Durnev et al. (2003), Ayres and Freeman (2003), Jiambalvo et al. (2002), and Piotroski and Roulstone (2004).

TABLE 1
Sample Selection

Panel A: Sample Selection Process

Sample Selection Criteria	Number of Firms	Number of Firm-Years
Listed firms available from Compustat[a]	14,112	59,267
Delete if E_{t-1}, E_t, or E_{t+1} data are missing[b]	(4,403)	(17,680)
Sample with earnings data available	9,709	41,587
Delete if R_t or R_{t+1} data are missing[b]	(11)	(75)
Sample with earnings and return data available	9,698	41,512
Delete transition year[c]	(102)	(6,483)
Sample with data for 1995~1997 and/or 1999~2001	9,596	35,029
Delete if firm does not have at least one observation in both the pre-131 and the post-131 period	(2,627)	(4,938)
Sample with at least one pre- and one post-131 observation	6,969	30,091
Delete firms making acquisitions or divestitures during any year of the sample period	(142)	(8,393)
Final Sample	6,827	21,698

Panel B: Disaggregation of Sample

	All Firm Sizes		Large Firms[e]		Small Firms[e]	
Sample Categories	No. of Firms	No. of Firm-Years	No. of Firms	No. of Firm-Years	No. of Firms	No. of Firm-Years
Pre-131 single or multiple segments	6,827	21,698	5,181	16,895	1,646	4,803
Pre-131 single-segment firms[d]	1,870	5,462	1,504	4,681	366	781
Pre-131 multiple segment firms[d]	4,957	16,236	3,677	12,214	1,280	4,022

[a] The Segment Item Value File is a subset of the Compustat Business Information File, which is a companion to the Compustat Annual Files. Form 10-K disclosures are the primary source of the segment information in the file (confirmed by telephone call to Compustat).

[b] Current returns are regressed on prior earnings, future earnings and future returns for the period 1995–2001. So earnings and return data are required for 2002 in order to estimate the models for year 2001. In addition, 1994 earnings are required for E_{t-1} to estimate the model for 1995.

[c] For December-May fiscal year-end firms, the transition year in Compustat is 1998, while for June-November fiscal year-end firms, the transition year in Compustat is 1999. This is because Compustat treats fiscal years ending January 1 through May 31 as ending in the prior calendar year, and fiscal years ending June 30 through November 30 as ending in the next calendar year.

[d] "Pre-131 single-segment firms" denotes firms that disclose single-segments in the pre-131 era. "Pre-131 multiple segment firms" denotes firms that disclose multiple segments in the pre-131 period.

[e] Large firms are covered by the I/B/E/S detail database and have revenues of at least $20 million in each sample year. Small firms are not covered by the I/B/E/S detail database or have revenues of less than $20 million in any sample year.

2001, a period including both pre- and post-SFAS No. 131 reporting regimes.[9] From this group we delete 4,403 firms for which earnings per share data were not available from Compustat, and 11 firms for which data required to compute total annual stock returns

---

[9] Subsequently we employ the 2003 Compustat Industrial Annual File to obtain 2002 data for variables E_{t+1} and R_{t+1} for June–November fiscal year-end firms.

were not available. We then delete all observations for the transition year of December 1998 through November 1999, including observations for 102 firms whose only available data was for 1998. At this point, the sample contains 9,596 firms and observations for 35,029 firm-years. We delete 2,627 firms that lacked at least one observation in the pre-131 period and one observation in the post-131 period, leaving 6,969 firms. Finally, we delete 142 firms that reported a merger, acquisition, or divestiture during 1995–2001, according to Compustat. Such firms made structural changes that likely affect their segment disclosures for reasons unrelated to the reporting regime. This leaves 6,827 firms, with 21,698 firm-year observations.[10] Segment information is obtained from the Compustat Segment Item Value File.[11]

Panel B of Table 1 disaggregates our sample by firm size and segment-reporting status in the pre-131 period. We disaggregate by pre-131 status, because SFAS No. 131 likely affected differently firms that were single- versus multiple-segment disclosers under SFAS No. 14. We disaggregate by size, because we want to know whether the information benefits due to SFAS No. 131 found by B&H (i.e., improved analyst forecast accuracy) also apply to small firms that are likely not well covered by analysts and thus have a relatively poor information environment. Following B&H (2003) we define large firms as those covered by the I/B/E/S database, and that have revenues of at least $20 million in a sample year; we define small firms as firms not covered by the I/B/E/S detail database or that have revenues of less than $20 million in any sample year.

Table 2 provides more detailed information about the segment-reporting status of firms in our sample. It shows the distribution of firm-years, disaggregated into single-segment versus multiple-segment subsets, both for pre-131 and post-131 years. We find that a substantial portion (over 26 percent) of the firm-year observations provided by firms that disclosed single segments in the *pre* period, are disclosures of multiple-segments in the *post*

TABLE 2
Segment Reporting Status: Pre- versus Post-131

	Post-131		
Pre-131	**Single-Segment**	**Multi-Segment**	**Total**
Single-segment	4,032[a] (73.82%)	1,430 (26.18%)	5,462 (100.00%)
Multi-segment	2,042 (12.58%)	14,194 (87.42%)	16,236 (100.00%)
Total	6,074 (27.99)	15,624 (72.01%)	21,698 (100.00%)

[a] 4,032 firm-year observations are provided by firms that reported a single segment in the pre-131 period *and* in the post-131 period. These observations constitute 73.82 percent of all observations provided by firms that reported single segments in the pre-131 period. (The remaining 26.18 percent are provided by firms that reported single segments in the pre- period, but reported multiple segments in the post- period.) Data in the other cells of the table can be interpreted similarly.

---

[10] We use Compustat annual data items #129 (Acquisitions) and #66 (Discontinued Operations) to determine whether there were structural changes. All tests reported in the paper are repeated on the sample that includes the firms that experienced structural changes. Very similar results are obtained.

[11] The Segment Item Value File is a subset of the Compustat Business Information File, which is a companion to the Compustat Annual Files. Form 10-K disclosures are the primary source of the segment information in the file (confirmed by telephone call to Compustat).

period. This evidence shows that SFAS No. 131 achieved one of its intended effects, increased disaggregation by single-segment firms. Conversely relatively few (less than 13 percent) of the firm-year observations provided by firms that disclosed multiple segments in the *pre* period, are disclosures of single segments in the *post* period.

Table 3 provides descriptive statistics for study variables.[12] Panel A describes firms that disclosed single segments in the *pre* period. Statistics are provided for firm-year observations, pooled over years, for the pre-131 and post-131 periods. Panel B provides the same statistics for firms that were multiple-segment disclosers in the *PRE* period. For both groups, firm performance, measured both by stock returns and accounting earnings, was superior in the *pre* period. For example, in the *pre* period, fewer than one-half of the firms in each group experienced negative returns, while in the *post* period over one-half of the firms in each group did.

This decline in performance is important for our tests, because Basu (1997) shows that due to the conservatism principle, earnings are more timely (i.e., there is a stronger relation between current returns and current earnings) when news is bad and are less timely (i.e., there is a stronger relation between current returns and future earnings) when news is good, where good versus bad news is defined by the sign of the contemporaneous stock return. Thus, since returns declined in the *post* period, we expect a weaker relation between current returns and future earnings, relative to the *pre* period, *ceteris paribus*. If the information benefits of SFAS No. 131 strengthened the association between returns and future earnings among affected firms, these benefits must have been strong enough to overcome the offsetting effects of conservatism during a period of (relatively) bad news.

VI. MODELS AND RESULTS

It is likely that the impact of the change in disclosure rules varied across firms based not only on their pre-131 segment status and size, but also based on how they were affected by the change and, in particular, whether or not they increased disaggregation of segments. To assess differential effects across firms, we use two measures of SFAS No. 131's impact on the degree of segment disaggregation: (1) a dichotomous measure, *INC*, defined as 1 if a firm increased the number of its reported business segments (and 0 otherwise), and (2) a continuous measure, *CHGAGG*, described below. Thus, our approach to assessing the effects of SFAS No. 131 is analogous to Berger and Hann (2003, Table 5), who also use both discrete and continuous measures of the effects of SFAS No. 131 on segment disaggregation.

As pointed out above, one hypothesized effect of SFAS No. 131 is that it increased the amount of information available to investors by causing firms to increase the number of segments disclosed. As previously discussed, and consistent with prior literature, Table 2 shows that many firms that disclosed single segments, under SFAS No. 14, increased the number of their reported segments when adopting SFAS No. 131. This was an intended effect of SFAS No. 131, meant to increase the segment information available to the market. We test whether greater numbers of business segments, per se, increased informativeness by including the effect on FERC of changing the number of reported segments:

---

[12] Descriptive statistics are for data with outliers truncated. We truncated returns and earnings observations greater than the 99th percentile and lower than the 1st percentile.

TABLE 3
Descriptive Statistics[a] of Study Variables

Panel A: Firms Disclosing Single Segments in the Pre-131 Period[b]

	Pre-131			Post-131		
Variables[c]	**Mean**	**Median**	**Standard Error**	**Mean**	**Median**	**Standard Error**
R_t	0.1085	0.0979	0.0089	0.0509	−0.0674	0.0118
E_{t-1}	0.0222	0.0616	0.0024	−0.0183	0.0531	0.0038
E_t	0.0379	0.0629	0.0023	−0.0020	0.0542	0.0034
E_{t+1}	0.0419	0.0573	0.0024	0.0290	0.0545	0.0028
R_{t+1}	0.0591	0.0082	0.0095	0.0001	−0.0105	0.0103
SIZE	5.7239	5.8386	0.0470	5.8222	5.9975	0.0489
CHGAGG	NA	NA	NA	−0.3686	0.0000	0.0227
MKT_BOOK	1.6087	1.6289	0.0556	1.6252	1.4023	0.0757
Frequency (%) of:						
Negative returns (*SIGN*)		909 (33.33%)			1,526 (55.80%)	
Negative earnings (*LOSS*)		595 (21.82%)			855 (31.26%)	
High firm-level earnings variability (*FIRM_EVAR*)		641 (25.17%)			939 (35.39%)	
Number of observations		2,727			2,735	

Panel B: Firms Disclosing Multiple Segments in the Pre-131 Period[b]

	Pre-131			Post-131		
Variables[c]	**Mean**	**Median**	**Standard Error**	**Mean**	**Median**	**Standard Error**
R_t	0.0983	0.0421	0.0054	0.1046	−0.0348	0.0081
E_{t-1}	−0.0079	0.0374	0.0015	−0.0404	0.0316	0.0025
E_t	0.0131	0.0395	0.0014	−0.0195	0.0260	0.0024
E_{t+1}	0.0217	0.0357	0.0016	0.0088	0.0201	0.0020
R_{t+1}	0.0423	−0.0352	0.0057	−0.0287	−0.1030	0.0068
SIZE	4.5348	4.3595	0.0247	4.8718	4.7622	0.0273
CHGAGG	NA	NA	NA	−0.3576	0.0000	0.0266
MKT_BOOK	1.5771	1.7445	0.0412	1.6294	1.3760	0.0524
Frequency (%) of:						
Negative returns (*SIGN*)		3,959 (45.29%)			3921 (52.31%)	
Negative earnings (*LOSS*)		2,993 (34.24%)			3,130 (41.76%)	
High firm-level earnings variability (*FIRM_EVAR*)		4,197 (53.35%)			3,728 (51.95%)	
Number of observations		8,741			7,495	

---

[a] Descriptive statistics are for data with outliers truncated. We truncate returns and earnings observations greater than the 99th percentile and lower than the 1st percentile. Results presented in Tables 4–7 reflect truncation.

[b] See Table 1 for sample information.

[c] See Exhibit 1 for variable definitions. Variable *CHGAGG* is not defined in the pre-131 period.

EXHIBIT 1
Definitions of Study Variables

Returns and Earnings Variables

R_{it}	is the annual stock return for year t, measured over the 12-month period ending three months after the firm's fiscal year-end.
E_{it}	is income available to common shareholders before extraordinary items in year t; deflated by market value of equity three months after the year $t-1$ fiscal year-end.
E_{it-1}	is income available to common shareholders before extraordinary items for the year preceding year t; deflated by market value of equity three months after the year $t-1$ fiscal year-end.
E_{it+1}	is income available to common shareholders before extraordinary items for the year following year t; deflated by market value of equity three months after the year $t-1$ fiscal year-end.
R_{it+1}	is the annual stock return for one year period following year t, measured over the 12-month period ending three months after the firm's fiscal year-end.

Control Variables

INC	1 if $NSEG^{post} - NSEG^{pre} > 0$; and 0 otherwise. $NSEG^{pre}$ is the number of business segments reported under SFAS No. 14 in 1997 and $NSEG^{post}$ is the number of business segments reported under SFAS No. 131 in 1999–2002.
CHGAGG	Segment aggregation, *AGG*, is the number of four-digit SIC codes in which a firm operates, minus the number of business segments reported in a given year. *CHGAGG* equals *AGG* for a given year minus *AGG* for 1997 (the final year in the pre-131 period).
LOSS	1 if $E_{t+1} < 0$; 0 otherwise.
SIGN	1 if the sign of current return, R_t is negative; 0 otherwise.
FIRM_EVAR	1 if earnings variability < 0.0248 (median); 0 otherwise. Firm earnings variability is the standard deviation of EBIT/TA, (earnings before interest and taxes for a year, divided by average total assets), for the preceding five years of a sample firm in a particular year.
SIZE	is the natural logarithm of market value of equity.
MKT_BOOK	is the ratio of market value of common equity to book value of common equity.
POST	1 in each of the years since SFAS No. 131 was promulgated (1999–2002); 0 for preceding years (1995–1998).

$$\begin{aligned} R_t = {} & a_0 + a_1 POST + a_2 INC + b_0 E_{t-1} + b_1 E_t + b_2 E_{t+1} + b_3 R_{t+1} + b_4 POST{*}E_{t-1} \\ & + b_5 POST{*}E_t + b_6 POST{*}E_{t+1} + b_7 POST{*}R_{t+1} + c_0 POST{*}INC \\ & + c_1 POST{*}INC{*}E_{t-1} + c_2 POST{*}INC{*}E_t + c_3 POST{*}INC{*}E_{t+1} \\ & + c_4 POST{*}INC{*}R_{t+1} + d_0 INC{*}E_{t-1} + d_1 INC{*}E_t + d_2 INC{*}E_{t+1} \\ & + d_3 INC{*}R_{t+1} + u_t \end{aligned} \tag{4}$$

where *INC* = 0 if the number of segments decreased or stayed the same from the *pre-* to the post-131 period, and $INC = 1$ if the number of business segments increased. The terms that include $POST \times INC$ capture the effect on FERC of increasing the number of disclosed segments between regimes. For firms whose number of business segments stayed constant or decreased from the pre- to the post-131 period, the change in FERC is captured by b_6; for firms whose number of segments increased, the change in FERC is captured by $b_6 + c_3$. Parameter c_3 captures the incremental effect on FERC due to increases in the number of segments disclosed in the *post* period. Thus, one benefit of the above model is that it captures the effect of SFAS No. 131 on FERCs of firms that disclosed single segments in the *pre* period, but reported multiple segments in the *post* period.

Although we are primarily interested in the coefficients on future earnings, we interact variable *POST* with all of the regressors, thereby allowing all of the coefficients to vary by period. If the other coefficients do vary, but are constrained to be equal, any shift in FERC that we estimate might be due to the inappropriate restriction. On the other hand, if the coefficients on the other variables do not vary by period, estimating additional parameters decreases the power of the test, by reducing degrees of freedom. This would bias against our ability to find a relation between adoption of SFAS No. 131 and informativeness.

Estimating Equation (4) also is important because it isolates the change in FERC from the pre- to the post-131 period for firms that were unaffected by SFAS No. 131, and thus acts as our control for any changes contemporaneous to SFAS No. 131 that might also have affected FERC. SFAS No. 131 did not affect firms that were single segment in the pre period, and that remained single segment in the post period. Thus, the term $b_6 POST \times E_{t+1}$ in Equation (4), for pre-131 single-segment firms, captures the change in FERC from pre-131 to post-131 for firms unaffected by SFAS No. 131. This controls for the effect on FERC of any macro changes, other than SFAS No. 131, that occurred during our sample period. If b_6 is less than or equal to 0 for pre-131 single-segment firms, we can be confident that any positive shifts in FERC for pre-131 multiple segment firms likely are due to SFAS No. 131, not to other macro changes.[13]

Table 4 presents the results of estimating Equation (4).[14] The table allows side-by-side comparisons of estimated coefficients for firms that disclosed single versus multiple segments in the *pre* period. The comparison is provided for Large Firms, Small Firms, and All Firms combined. As expected, all subsamples have significant, positive (negative) coefficients on current (lagged) earnings (E_t and E_{t-1}) and significant, negative coefficients on future returns (R_{t+1}). However, only large firms have significant, positive FERCs (on E_{t+1}), perhaps due to their superior information environment.

Table 4 shows that there was no increase in FERC for single-segment firms that remained single segment, since the coefficient of $POST \times E_{t+1}$ is insignificant both for large and small, pre-131 single-segment firms. Based on these insignificant coefficients for $POST \times E_{t+1}$, we infer that there were no macro changes contemporaneous to SFAS No. 131 that caused FERC to increase. However larger pre-131 single-segment firms, that increased their numbers of reported business segments (i.e., became multi-segment), had a significant increase in FERC. This is indicated by the positive, significant sum of the coefficients for these firms on $POST \times E_{t+1}$ and $POST \times INC \times E_{t+1}$ (see p-values for linear restriction

---

[13] Note that $b_6 POST \times E_{t+1}$ for multiple segment firms cannot be a control for other macro changes during our sample period, since multi-segment firms may have experienced qualitative disclosure changes due to SFAS No. 131, even if $INC = 0$.

[14] For all regressions, results are reported after truncation of returns and earnings observations greater than the 99th percentile and lower than the 1st percentile. Alternatively, we delete these extreme observations from the sample, and our results are unchanged.

TABLE 4
Regression Results for Equation (4)

$$R_t = a_0 + a_1 POST + a_2 INC + b_0 E_{t-1} + b_1 E_t + b_2 E_{t+1} + b_3 R_{t+1} + b_4 POST{*}E_{t-1} + b_5 POST{*}E_t + b_6 POST{*}E_{t+1} + b_7 POST{*}R_{t+1} + c_0 POST{*}INC + c_1 POST{*}INC{*}E_{t-1} + c_2 POST{*}INC{*}E_t + c_3 POST{*}INC{*}E_{t+1} + c_4 POST{*}INC{*}R_{t+1} + d_0 INC{*}E_{t-1} + d_1 INC{*}E_t + d_2 INC{*}E_{t+1} + d_3 INC{*}R_{t+1} + u_t \quad (4)$$

	Sample Subset					
	All Firms[a]		Large Firms[b]		Small Firms[c]	
Explan. Variables[d]	Pre-131 Single-Segment Firms[e]	Pre-131 Multiple Segment Firms[e]	Pre-131 Single-Segment Firms[e]	Pre-131 Multiple Segment Firms[e]	Pre-131 Single-Segment Firms[e]	Pre-131 Multiple Segment Firms[e]
Intercept	0.1118***	0.0688***	0.0914***	0.0574***	−0.0232	0.0878***
	(.0001)	(.0001)	(.0001)	(.0001)	(.6522)	(.0001)
E_{t-1}	−0.5165***	−0.7799***	−0.4804***	−0.7651***	−0.8448***	−0.7216***
	(.0001)	(.0001)	(.0001)	(.0001)	(.0020)	(.0001)
E_t	1.5599***	1.3893***	1.6920***	1.3812***	1.1840***	1.4094***
	(.0001)	(.0001)	(.0001)	(.0001)	(.0002)	(.0001)
E_{t+1}	0.4553***	0.4594***	0.7709***	0.6848***	−0.1793	0.1702
	(.0001)	(.0001)	(.0001)	(.0001)	(.4878)	(.1327)
R_{t+1}	−0.2167***	−0.1162***	−0.2473***	−0.1386***	−0.2088***	−0.0863***
	(.0001)	(.0001)	(.0001)	(.0001)	(.0006)	(.0014)
POST	−0.0982***	0.0356***	−0.1255***	0.0323***	0.0695	0.0370
	(.0001)	(.0009)	(.0001)	(.0059)	(.4543)	(.1627)
POST × E_{t-1}	−0.4311***	−0.1850**	−0.3959**	−0.1305	0.2648	−0.2388**
	(.0028)	(.0053)	(.0163)	(.1244)	(.4959)	(.0488)
POST × E_t	−0.7581***	−0.5629***	−0.6374***	−0.4084***	−1.0623**	−0.7412***
	(.0001)	(.0001)	(.0009)	(.0001)	(.0295)	(.0001)
POST × E_{t+1}	0.0616	0.4012***	0.0367	0.2182**	−0.2189	0.5645***
	(.7109)	(.0001)	(.8318)	(.0173)	(.6585)	(.0001)
POST × R_{t+1}	0.0177	−0.1742***	0.0262	−0.1610***	0.0530	−0.1821***
	(.6086)	(.0001)	(.4630)	(.0001)	(.5889)	(.0001)
POST × *INC*	0.0338	−0.0175	0.0918***	−0.0109	−0.0242	0.0044
	(.3041)	(.3187)	(.0060)	(.5513)	(.8704)	(.9375)

(*continued on next page*)

TABLE 4 (continued)

	Sample Subset					
	All Firms[a]		Large Firms[b]		Small Firms[c]	
Explan. Variables[d]	Pre-131 Single-Segment Firms[e]	Pre-131 Multiple Segment Firms[e]	Pre-131 Single-Segment Firms[e]	Pre-131 Multiple Segment Firms[e]	Pre-131 Single-Segment Firms[e]	Pre-131 Multiple Segment Firms[e]
$POST \times INC \times E_{t-1}$	0.3757*	−0.2000*	−0.3035	0.1344	1.4570**	0.2954
	(.0962)	(.0822)	(.2572)	(.3163)	(.0125)	(.2484)
$POST \times INC \times E_{t}$	−0.6802**	−0.1787	−0.2560	−0.3433**	−1.2494*	−0.0758
	(.0126)	(.1849)	(.4026)	(.0240)	(.0839)	(.8055)
$POST \times INC \times E_{t+1}$	0.5100**	−0.0894	0.4426**	0.1261	0.3799	−0.1625*
	(.0428)	(.5017)	(.0431)	(.3956)	(.6238)	(.0868)
$POST \times INC \times R_{t+1}$	0.0055	−0.0506	0.0004	−0.0541	0.0313	−0.0430
	(.9210)	(.1180)	(.9951)	(.1290)	(.8364)	(.5798)
INC	−0.0183	0.0004	−0.0364	−0.0060	−0.0170	0.0325*
	(.3821)	(.9522)	(.1081)	(.3936)	(.7982)	(.0768)
$INC \times E_{t-1}$	−0.1591	−0.1501***	0.1868	−0.1075*	−0.6464**	−0.1380
	(.2335)	(.0027)	(.2714)	(.0729)	(.0337)	(.1834)
$INC \times E_{t}$	0.3481**	0.1104*	0.1362	0.1468**	0.4785	0.1089
	(.0283)	(.0647)	(.4859)	(.0337)	(.1944)	(.3840)
$INC \times E_{t+1}$	0.1400	0.1935***	−0.0266	0.0850	0.0671	0.2626**
	(.3221)	(.0003)	(.8824)	(.1730)	(.8391)	(.0155)
$INC \times R_{t+1}$	−0.0557*	−0.0035	−0.0219	−0.0055	−0.0781	0.0194
	(.0683)	(.7795)	(.6234)	(.7044)	(.2287)	(.4646)
Number of Observations	5,462	16,236	4,681	12,214	781	4,022
Adjusted R^2	13.54	14.24	21.27	16.33	7.39	11.73
Linear restriction $b_6 + c_3 = 0$	p value = 0.0001	p-value = 0.0001	p-value = 0.0029	p-value = 0.0001	p-value = 0.2579	p-value = 0.0077

---

*, **, *** Significant at the 10 percent, 5 percent, and 1 percent levels, respectively. Coefficient estimates (p-values).

[a] See Table 1 for sample information.

[b] Large firms are covered by the I/B/E/S detail database and have revenues of at least $20 million in each sample year.

[c] Small firms are not covered by the I/B/E/S detail database or have revenues of less than $20 million in any sample year.

[d] See Exhibit 1 for variable definitions.

[e] "Pre-131 single-segment firms" denotes firms that disclose single-segments in the pre-131 era. "Pre-131 multiple segment firms" denotes firms that disclose multiple-segments in the pre-131 period.

$b_6 + c_3 = 0$). This is consistent with B&H, who show that disaggregation of segments under SFAS No. 131 increased analyst forecast accuracy for large, previously single-segment firms. However, smaller pre-131 single-segment firms do not exhibit increases in FERC, regardless of whether they increase the numbers of their segments (see p-values for linear restriction $b_6 + c_3 = 0$). These results show the importance of examining both large, well-followed firms, as well as smaller firms not studied by prior SFAS No. 131 research.

Table 4 also shows that large, pre-131 multi-segment firms have increased FERCs in the post-131 period (the coefficients of $POST \times E_{t+1} > 0$). This increase was not due to the effects of disaggregation per se (the coefficient of $POST \times INC \times E_{t+1}$ is not significantly positive for these firms). Thus, although FERCs shift upward for large, pre-131 multi-segment firms (see p-values for linear restriction $b_6 + c_3 = 0$) the increase appears due to the qualitative effects of SFAS No. 131, rather than increased disaggregation of segments.

Similarly, small pre-131 multi-segment firms experienced an increase in FERC due to SFAS No. 131 (see p-value for linear restriction $b_6 + c_3 = 0$), but again this increase was not due to the effects of disaggregation per se (the coefficient of $POST \times INC \times E_{t+1}$ is not significantly positive for these firms). This result suggests that the qualitative effects of SFAS No. 131 also were responsible for smaller multi-segment firms' increase in FERC, which is consistent with another intended effect of SFAS No. 131: to make multi-segment firms' segment disclosures more informative, even without greater disaggregation. The Appendix provides a discussion of qualitative improvements in segment disclosure under SFAS No. 131 (i.e., other than greater disaggregation of segments) that likely explain the increase in FERC both for smaller and larger, pre-131 multi-segment firms. In summary, Table 4 shows that for pre-131 multi-segment firms there is no evidence that an increase in segment disaggregation is associated with an increase in FERC. Thus, any increases in FERC for these firms are likely due to the qualitative changes of the new standard.[15,16]

It might be argued that our use of single-segment firms as a control for macroeconomic changes during our sample period is inadequate, because firms expanding numbers of segments are those most likely to be exercising growth options, and the market's valuation of growth options and future earnings increased during the late-1990s stock market boom. In this view, the change in a firm's segment status and the resulting valuation (change in FERC) from the *pre* to the *post* period are determined by firms' self-selection, in response to economy-wide events, and not the result of the switch to SFAS No. 131. We strongly doubt this argument for a number of reasons.

First, the above argument presumes that firms grow (invest in positive NPV projects) by adding segments, but many firms grow by expanding existing segments. Likewise, many firms increased their numbers of segments, post-131, without growing. In fact, B&H provide evidence that relatively few firms that expanded from single to multiple segments when adopting SFAS No. 131 did so as the result of growth.[17] Thus, increases in numbers of segments and growth (investment in positive NPV projects) are not necessarily related.

---

[15] Since our *POST* period includes the implementation of Regulation (Reg.) FD in October 2000, it is possible that our evidence on increased informativeness might be affected by the effects of Reg. FD. However, Shane et al. (2001), Heflin et al. (2003), and Agrawal and Chadha (2003) find no evidence of increased analyst forecast accuracy associated with Reg. FD, making it unlikely that our results are due to Reg. FD.

[16] In Table 4 and in subsequent tables, the coefficients of $POST{*}R_{t+1}$ are negative for pre-131 multiple segment firms, indicating that the coefficient of R_{t+1} is more negative in the *POST* period than in the *PRE* period. This is due to the increased negative correlation between R_t and R_{t+1} in the *POST* period for these firms. For example, the correlation for pre-131 multiple segment firms is −0.0922 in *PRE* and −0.1680 in *POST*.

[17] Berger and Hann (2003, 179) state, "We are thus left with 45 segments (from 37 firms) in which the reported increase is potentially attributable to internal growth."

Second, the percentage of firms increasing their segment numbers coincident with adoption of SFAS No. 131 appears too great in magnitude to be explained by economy-wide factors.[18] Third, prior to 1998–2000, many managers wrote letters to the FASB, in response to the exposure draft that preceded SFAS No. 131. In reading those letters, Ettredge et al. (2002) found that a number of managers predicted that their firms would be required to report additional segments upon adopting SFAS No. 131. Clearly, this could not have been caused by subsequent, unanticipated macroeconomic events.

Fourth, even if firms with growth options diversified, increased their number of reported segments for reasons unrelated to SFAS No. 131, and attracted higher market valuations, this would not necessarily result in higher FERCs. Moreover, our evidence that the increase in FERC for multi-segment firms is unrelated to the increase in the number of their segments, is clearly inconsistent with an argument that the post-131 shift in FERC is caused by economy-wide factors operating through increases in segment numbers. Finally, we control explicitly for inter-firm differences in growth opportunities (by including market-to-book ratios) in the models presented in Tables 6 and 7, and our conclusions are unchanged. For all these reasons, we believe that the increases in FERC are due to SFAS No. 131.

Our second measure of firms' disaggregation of segment information is the change in the degree to which numbers of disclosed business segments correspond to diversity of firms' activities. We test for this with a continuous measure of change in aggregation of activities after adoption of SFAS No. 131, *CHGAGG*:

$$\begin{aligned} R_t = {} & a_0 + a_1 POST + b_0 E_{t-1} + b_1 E_t + b_2 E_{t+1} + b_3 R_{t+1} + b_4 POST^*E_{t-1} \\ & + b_5 POST^*E_t + b_6 POST^*E_{t+1} + b_7 POST^*R_{t+1} + c_0 POST^*CHGAGG \\ & + c_1 POST^*CHGAGG^*E_{t-1} + c_2 POST^*CHGAGG^*E_t \\ & + c_3 POST^*CHGAGG^*E_{t+1} + c_4 POST^*CHGAGG^*R_{t+1} + u_t. \end{aligned} \tag{5}$$

For a given year we define an aggregation ratio, *AGG*, as the number of four-digit SIC codes in which the firm operates, minus the number of business segments the firm discloses. The change in aggregation, *CHGAGG*, equals *AGG* for a given year minus *AGG* for a base year.[19]

We use 1997 as the base year. Negative values of *CHGAGG* characterize firms that report more segments, relative to the variety of their production activities captured by SIC codes, in the current year compared to the base year. Thus negative values of *CHGAGG* indicate increased disaggregation of segment earnings. In essence, *CHGAGG* provides an inverse, continuous measure of change in number of business segments disclosed, while controlling for any contemporaneous change in diversity of operations (number of four-digit SIC industries).[20] The expected sign on $POST \times CHGAGG \times E_{t-1}$ is negative, since increased disaggregation arguably reveals information.

---

[18] Berger and Hann (2003, 176) conclude, "These results indicate a significant movement from single to multi-segment reporting under the new reporting regime." Thus they attribute increased segment numbers to adoption of SFAS No. 131, not to internal growth.

[19] Alternatively we defined *AGG* as the number of four-digit SIC codes in which the firm operates, divided by the number of business segments the firm discloses. Results were similar to those reported in Table 5. Note that a change in *AGG* can result from either a change in the number of SIC codes in which a firm operates or a change in the number of business segments it discloses. We assume that a change in SIC codes is exogenous to and independent of SFAS No. 131; thus, the coefficients of *CHGAGG* reflect the effect of SFAS No. 131 on FERC via segment aggregation.

[20] The four-digit SIC codes were obtained from the Compustat NAIC file, within the Compustat Business Information file.

The results for model (5) are reported in Table 5. Similar to Table 4, the coefficients of E_{t+1} in Table 5 are positive and significant for All Firms and for Large Firms, but not for Small Firms, and the results for $POST \times E_{t+1}$ also are similar to those in Table 4. Table 5 shows the expected negative and significant coefficients for $POST \times CHGAGG \times E_{t+1}$, for All Firms and for Large Firms, both pre-131 single segment and pre-131 multiple segment. The estimated coefficients are insignificant for Small Firms, both single and multiple segments. These results indicate that, when adopting SFAS No. 131, larger firms experienced negative (positive) influences on FERC if they increased (decreased) the aggregation of their productive activities into segments.

In summary, in Tables 4 and 5 we test the effects of changes in aggregation and disaggregation of segments and activities, using both dichotomous and continuous measures of aggregation/disaggregation. Our results are similar across the two models, especially for All Firms pooled. pre-131 single-segment firms experienced increased FERCs only when they increased disaggregation of segment data. pre-131 multiple-segment firms experienced positive FERC shifts, regardless of whether they increased disaggregation of segment data.[21] Both tables suggest that FERCs of Small pre-131 single-segment firms were unaffected by SFAS No. 131, regardless of whether they increased the numbers of their reported segments (*INC*) or the aggregation into segments of their productive activities (*CHGAGG*).

VII. THE EFFECTS OF FIRM CHARACTERISTICS

Above we show that, for firms of all sizes, FERC increased from the pre-131 to the post-131 period, both for firms that disclosed multiple segments under SFAS No. 14, and for firms that disclosed a single segment under SFAS No. 14 and became multi-segment disclosers under SFAS No. 131.[22] Only firms that remained single segment under both SFAS No. 14 and SFAS No. 131 did not experience an increase in FERC. Although this combination of results makes it unlikely that other concurrent macroeconomic events caused the shift in FERCs, we want to be sure that other changes in the firms themselves did not cause the changes.

In addition to price informativeness, the relation between current returns and future earnings depends on both the timeliness and variability (forecastability) of earnings. When earnings are more timely, returns have a stronger relation with contemporaneous earnings and a weaker relation with future earnings. In contrast, returns have a stronger relation with future earnings that are less variable (more predictable, less uncertain). In order to be sure that any shift in FERC is due to SFAS No. 131 and not to other correlated but omitted factors that change over time, we next control for changes in earnings characteristics, and in the firms' information environments (firm size).

The literature has identified several proxies for the timeliness and forecastability of earnings. These include earnings growth, earnings persistence, and the information environment. To control for growth, we use the market-to-book (M/B) ratio, *MKT_BOOK*, a widely used measure of growth. Following Lundholm and Myers (2002), we proxy for earnings persistence using a dummy variable, *LOSS*, that equals 1 if next-year earnings are negative, and 0 otherwise. The amount of future negative earnings should be more difficult for the market to predict than the amount of future positive earnings, which are likely to be more normal and persistent. To control for timeliness of earnings, we employ a dummy variable for the *SIGN* of the contemporaneous return (Basu 1997) using a variable coded 1 for negative returns, R_t, and 0 otherwise. To control for earnings uncertainty we include

---

[21] Table 5 suggests they experienced additional FERC increases if their disaggregation of activities increased.

[22] See the results columns for All Firms in Table 4.

TABLE 5
Regression Results for Equation (5)

$$R_t = a_0 + a_1 POST + b_0 E_{t-1} + b_1 E_t + b_2 E_{t+1} + b_3 R_{t+1} + b_4 POST{*}E_{t-1} + b_5 POST{*}E_t + b_6 POST{*}E_{t+1} + b_7 POST{*}R_{t+1} + c_0 POST{*}CHGAGG + c_1 POST{*}CHGAGG{*}E_{t-1} + c_2 POST{*}CHGAGG{*}E_t + c_3 POST{*}CHGAGG{*}E_{t+1} + c_4 POST{*}CHGAGG{*}R_{t+1} + u_t \quad (5)$$

	Sample Subset					
	All Firms[a]		Large Firms[b]		Small Firms[c]	
Explan. Variables[d]	**Pre-131 Single-Segment Firms[e]**	**Pre-131 Multiple Segment Firms[e]**	**Pre-131 Single-Segment Firms[e]**	**Pre-131 Multiple Segment Firms[e]**	**Pre-131 Single-Segment Firms[e]**	**Pre-131 Multiple Segment Firms[e]**
Intercept	0.1154*** (.0001)	0.0716*** (.0001)	0.0934*** (.0001)	0.0606*** (.0001)	−0.0174 (.7301)	0.0731** (.0001)
E_{t-1}	−0.5463*** (.0001)	−0.7161*** (.0001)	−0.4902*** (.0001)	−0.7380*** (.0001)	−0.7142*** (.0067)	−0.6298*** (.0001)
E_t	1.5565*** (.0001)	1.3437*** (.0001)	1.6946*** (.0001)	1.3354*** (.0001)	1.1284*** (.0003)	1.3302*** (.0001)
E_{t+1}	0.4478*** (.0001)	0.3807*** (.0001)	0.7537*** (.0001)	0.6609*** (.0001)	−0.1569 (.5370)	0.0347 (.7037)
R_{t+1}	−0.2114*** (.0001)	−0.1139*** (.0001)	−0.2445*** (.0001)	−0.1377*** (.0001)	−0.1857*** (.0014)	−0.0941*** (.0001)
POST	−0.1039*** (.0001)	0.0291*** (.0014)	−0.1114*** (.0001)	−0.0292*** (.0029)	0.0509 (.5014)	0.0387 (.1153)
$POST \times E_{t-1}$	−0.2620** (.0239)	−0.1504** (.0131)	−0.5009*** (.0001)	−0.0950 (.2057)	0.6958** (.0335)	−0.1889 (.1054)
$POST \times E_t$	−1.0085*** (.0001)	−0.6071*** (.0001)	−0.7363*** (.0001)	−0.5131*** (.0001)	−1.4894*** (.0002)	−0.7292*** (.0001)
$POST \times E_{t+1}$	0.1173 (.1241)	0.4176*** (.0001)	0.1495* (.0986)	0.2736*** (.0007)	−0.0843 (.8314)	0.4724*** (.0003)
$POST \times R_{t+1}$	−0.0071 (.8057)	−0.1965*** (.0001)	0.0083 (.7797)	−0.1874*** (.0001)	0.0234 (.7746)	−0.1856*** (.0001)

(*continued on next page*)

TABLE 5 (continued)

POST × *CHGAGG*	0.0057	0.0061**	0.0074	0.0052*	0.0018	−0.0033
	(.4289)	(.0373)	(.2655)	(.0711)	(.9598)	(.7736)
POST × *CHGAGG* × E_{t-1}	−0.0267	−0.0179	0.0101	0.0035	−0.1477	−0.0969**
	(.4328)	(.2645)	(.7672)	(.8381)	(.1897)	(.0319)
POST × *CHGAGG* × E_t	0.0474	−0.0234	0.0524	−0.0058	0.0462	−0.0425
	(.3046)	(.2176)	(.2702)	(.7663)	(.7310)	(.4278)
POST × *CHGAGG* × E_{t+1}	−0.1698***	−0.0536**	−0.1718***	−0.0522**	0.1794	0.0469
	(.0006)	(.0184)	(.0004)	(.0249)	(.3323)	(.4866)
POST × *CHGAGG* × R_{t+1}	0.0065	−0.0093	0.0048	−0.0087	−0.0015	−0.0238
	(.5948)	(.1032)	(.7042)	(.1433)	(.9657)	(.1305)
Number of Observations	5,462	16,236	4,681	12,214	781	4,022
Adjusted R^2	13.32	14.21	21.30	16.33	6.38	11.66

---

*, **, *** Significant at the 10 percent, 5 percent, and 1 percent levels, respectively. Coefficient estimates (p-values).

[a] See Table 1 for sample information.

[b] Large firms are covered by the I/B/E/S detail database and have revenues of at least $20 million in each sample year.

[c] Small firms are not covered by the I/B/E/S detail database or have revenues of less than $20 million in any sample year.

[d] See Exhibit 1 for variable definitions.

[e] "Pre-131 single-segment firms" denotes firms that disclose single-segments in the pre-131 era. "Pre-131 multiple segment firms" denotes firms that disclose multiple-segments in the pre-131 period.

a measure of firm-level earnings variability. The proxy for firm level variability is a dummy variable, *FIRM_EVAR*, that equals 1 if the standard deviation of EBIT/TA over the preceding five years is above our sample median, and 0 otherwise. We proxy for the information environment by *SIZE* (Atiase 1985; El-Gazzar 1998), measured as the natural log of market capitalization each year. Using these controls, we modify Equation (4) and estimate the following model for each control variable:

$$\begin{aligned} R_t = {} & a_0 + a_1 POST + a_2 INC + b_0 E_{t-1} + b_1 E_t + b_2 E_{t+1} + b_3 R_{t+1} + b_4 POST{*}E_{t-1} \\ & + b_5 POST{*}E_t + b_6 POST{*}E_{t+1} + b_7 POST{*}R_{t+1} + c_0 POST{*}INC \\ & + c_1 POST{*}INC{*}E_{t-1} + c_2 POST{*}INC{*}E_t + c_3 POST{*}INC{*}E_{t+1} \\ & + c_4 POST{*}INC{*}R_{t+1} + d_0 INC{*}E_{t-1} + d_1 INC{*}E_t + d_2 INC{*}E_{t+1} \\ & + d_3 INC{*}R_{t+1} + f_0 CTRL{*}E_{t-1} + f_1 CTRL{*}E_t + f_2 CTRL{*}E_{t+1} \\ & + f_3 CTRL{*}R_{t+1} + u_t \end{aligned} \qquad (6)$$

where *CTRL* is the particular control variable. We estimate Equation (6) separately for firms that were multi-segment versus single-segment under SFAS No. 14.

The expected signs on the coefficients of the *CTRL* × E_{t+1} interaction terms are as follows. Since firms with high M/B ratios tend to be growth firms, whose capitalized earnings are further in the future, the expected sign of *MKT_BOOK* × E_{t+1} is positive.[23] The expected sign of *LOSS* × E_{t+1} is negative, since negative earnings are both more timely and less persistent. The expected sign on *SIGN* × E_{t+1} is negative, because bad news is more timely (reflected more in current earnings) than good news. The expected sign of *FIRM_EVAR* × E_{t+1} is negative, since *FIRM_EVAR* is coded 1 for high variance firms and more variable earnings are both less persistent and more difficult to forecast. The expected sign of *SIZE* × E_{t+1} is positive, since large firms should have a richer information environment.

Table 6 presents regression results for model (6) estimated with pre-131 multi-segment firms. In Table 6, the coefficients on all five of the control variables interacted with E_{t+1} have the expected signs and are statistically significant. Most importantly, the results in Table 6 show that even when we control for factors that are known to affect the returns-earnings relation, we always find a significant upward shift in FERC in the *post* period for pre-131 multi-segment firms (see the coefficient for *POST* × E_{t+1}). This is strong evidence that SFAS No. 131 resulted in an increase in stock price informativeness for such firms.[24] The upward shift in FERC is so strong that, in effect, inclusion of the control variables cannot make it go away, and the introduction of control variables in Equation (6) causes almost no changes in our results.

Finally, we estimate Equation (6) using our sample of pre-131 single-segment firms, in order to examine whether our previous results for single-segment firms in Table 4 are robust to the inclusion of the controls. The estimated coefficients for the interactions of the control variables with future earnings (*CTRL* × E_{t+1}) have the expected signs and are significant (in three out of five regressions). We note that the FERC shifts in Table 7 are not significant (see coefficients for *POST* × E_{t+1}) for single-segment firms, consistent with the FERC shift for pre-131 single-segment firms in Table 4. Thus, the addition of

---

[23] Durnev et al. (2003) make the same point about including a control for growth in their FERC regression.

[24] Note that the adjusted R^2 of the model with *SIGN* added is three to four times as large as the other models. This reflects the fact that the sign of the year *t* stock return has substantial explanatory power for the magnitude and sign of the year *t* stock return.

TABLE 6
Regression Results for Equation (6) with Pre-131 Multi-Segment Firms[a,b]

	Control Variables				
Explan. Variables[c]	*MKT_BOOK* Market-to-Book Equity	*LOSS* Negative Earnings	*SIGN* Negative Stock Return	*FIRM_EVAR* Firm-Level Earnings Variance	*SIZE* Market Value of Equity
Intercept	0.0407***	−0.0086	0.4630***	0.0001	0.0787***
	(.0001)	(.3070)	(.0001)	(.9947)	(.0001)
E_{t-1}	−0.7888***	−0.4386***	−0.8227***	−0.5895***	0.0707
	(.0001)	(.0001)	(.0001)	(.0001)	(.3071)
E_t	1.3612***	1.3916***	0.3360***	1.4864***	1.2110***
	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)
E_{t+1}	0.4412***	1.3471***	0.2272***	0.9845***	−0.0113
	(.0001)	(.0001)	(.0001)	(.0001)	(.8759)
R_{t+1}	−0.1024***	−0.2109***	−0.1438***	−0.1373***	−0.0126
	(.0001)	(.0001)	(.0001)	(.0001)	(.5086)
POST	0.0300***	0.0177*	0.0697***	0.0264**	0.0353***
	(.0049)	(.0860)	(.0001)	(.0158)	(.0008)
$POST \times E_{t-1}$	−0.2022***	−0.2089***	−0.1352***	−0.1538**	−0.2696***
	(.0022)	(.0001)	(.0023)	(.0264)	(.0001)
$POST \times E_t$	−0.5580***	−0.3423***	−0.1030*	−0.5492***	−0.5600***
	(.0001)	(.0001)	(.0506)	(.0001)	(.0001)
$POST \times E_{t+1}$	0.3860***	0.1768**	0.2816***	0.4039***	0.4226***
	(.0001)	(.0143)	(.0001)	(.0001)	(.0001)
$POST \times R_{t+1}$	−0.1738***	−0.1390***	−0.1157***	−0.1585***	−0.1751***
	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)
$POST \times INC$	−0.0068	−0.0248	0.0002	−0.0094	−0.0222
	(.6991)	(.1411)	(.9880)	(.5964)	(.1996)

(continued on next page)

TABLE 6 (continued)

	Control Variables				
Explan. Variables[c]	*MKT_BOOK* Market-to-Book Equity	*LOSS* Negative Earnings	*SIGN* Negative Stock Return	*FIRM_EVAR* Firm-Level Earnings Variance	*SIZE* Market Value of Equity
$POST \times INC \times E_{t-1}$	0.1958* (.0871)	0.2003* (.0702)	−0.0368 (.6337)	0.2211* (.0613)	0.2614*** (.0212)
$POST \times INC \times E_t$	−0.1750 (.1915)	−0.2122 (.1019)	0.0122 (.8934)	−0.1817 (.1893)	−0.1470 (.2683)
$POST \times INC \times E_{t+1}$	−0.0848 (.5220)	0.3145** (.0143)	0.0087 (.9229)	−0.1274 (.3511)	−0.1516 (.2479)
$POST \times INC \times R_{t+1}$	−0.0498 (.1221)	−0.0828*** (.0078)	−0.0592*** (.0064)	−0.0541 (.1030)	−0.0414 (.1940)
INC	−0.0067 (.2992)	0.0136** (.0279)	−0.0043 (.3172)	0.0006 (.9223)	0.0035 (.5783)
$INC \times E_{t-1}$	−0.1432*** (.0042)	−0.1630*** (.0007)	0.0188 (.5756)	−0.1671*** (.0013)	−0.0168 (.7357)
$INC \times E_t$	0.1062* (.0740)	0.1225** (.0330)	−0.0481 (.2301)	0.1117* (.0730)	0.0631 (.2892)
$INC \times E_{t+1}$	0.1896*** (.0004)	0.0569 (.2693)	0.1004*** (.0051)	0.1850*** (.0009)	0.1181** (.0266)
$INC \times R_{t+1}$	0.0012 (.9268)	0.0096 (.4247)	0.0034 (.6877)	0.0018 (.8903)	0.0129 (.3015)
CTRL	0.0153*** (.0001)	−0.1969*** (.0001)	−0.8216*** (.0001)	0.0928*** (.0001)	−0.0005 (.1718)
$CTRL \times E_{t-1}$	−0.0011 (.8685)	−0.1398** (.0162)	1.0114*** (.0001)	−0.1473* (.0538)	−0.2786*** (.0001)
$CTRL \times E_t$	0.0262*** (.0008)	−0.2835*** (.0001)	0.1143** (.0131)	−0.1676** (.0297)	0.0464*** (.0054)

(*continued on next page*)

TABLE 6 (continued)

CTRL × E_{t+1}	0.0144*	−3.0551***	−0.1894***	−0.6363***	0.1554***
	(.0617)	(.0001)	(.0001)	(.0001)	(.0001)
CTRL × R_{t+1}	−0.0041**	0.1238***	0.1881***	0.0108	−0.0266***
	(.0236)	(.0001)	(.0001)	(.5585)	(.0001)
No. of Observations	16,236	16,236	16,236	16,236	16,236
Adjusted R²	15.33	21.01	61.54	15.53	16.76
Linear restriction $b_6 + c_3 = 0$	p-value = 0.0144	p-value = 0.0001	p-value = 0.0005	p-value = 0.0001	p-value = 0.0001

---

*, **, *** Significant at the 10 percent, 5 percent, and 1 percent levels, respectively. Coefficient estimates (p-values).

[a] See table 1 for sample information.

[b] "Pre-131 single-segment firms" denotes firms that disclose single-segments in the pre-131 era. "Pre-131 multi-segment firms" denotes firms that disclose multiple-segments in the pre-131 period.

[c] See Exhibit 1 for variable definitions.

TABLE 7
Regression Results for Equation (6) with Pre-131 Single-Segment Firms[a,b]

	Control Variables				
Explan. Variables[c]	***MKT_BOOK*** **Market-to-Book Equity**	***LOSS*** **Negative Earnings**	***SIGN*** **Negative Stock Return**	***FIRM_EVAR*** **Firm-Level Earnings Variance**	***SIZE*** **Market Value of Equity**
Intercept	0.0792***	−0.0117	0.4354***	0.0612***	0.1205***
	(.0001)	(.4013)	(.0001)	(.0001)	(.0001)
E_{t-1}	−0.4437***	−0.0485	−0.9133***	−0.4633***	0.4923***
	(.0001)	(.6500)	(.0001)	(.0006)	(.0001)
E_t	1.4363***	1.5979***	0.4757***	1.7143***	1.1307***
	(.0001)	(.0001)	(.0001)	(.0001)	(.0001)
E_{t+1}	0.4760***	1.7113***	0.1480**	1.0648***	−0.0812
	(.0001)	(.0001)	(.0381)	(.0001)	(.5265)
R_{t+1}	−0.1949***	−0.3229***	−0.2429***	−0.2562***	−0.0829***
	(.0001)	(.0001)	(.0001)	(.0001)	(.0079)
POST	−0.0984***	−0.0972***	0.0350***	−0.1083***	−0.0986***
	(.0001)	(.0001)	(.0017)	(.0001)	(.0001)
$POST \times E_{t-1}$	−0.4235**	−0.5072***	−0.4238***	−0.4205***	−0.4286***
	(.0031)	(.0002)	(.0001)	(.0039)	(.0026)
$POST \times E_t$	−0.7429***	−0.4857***	−0.0072	−0.6211***	−0.6160***
	(.0001)	(.0038)	(.9515)	(.0005)	(.0005)
$POST \times E_{t+1}$	0.0520	−0.2087	−0.0992	−0.0854	−0.1758
	(.7536)	(.1813)	(.3638)	(.6059)	(.2869)
$POST \times R_{t+1}$	0.0175	0.0084	−0.0326	0.0371	0.0355
	(.6100)	(.7948)	(.1552)	(.2860)	(.2971)
$POST \times INC$	0.0228	0.0432	0.0179	0.0412	0.0197
	(.4839)	(.1660)	(.4071)	(.2332)	(.5426)

(*continued on next page*)

TABLE 7 (continued)

POST × *INC* × E_{t-1}	0.2965 (.1852)	0.3301 (.1207)	0.4847*** (.0011)	0.5165** (.0266)	0.4044* (.0694)
POST × *INC* × E_t	−0.6470** (.0168)	−0.3645 (.1534)	−0.6343*** (.0004)	−0.6691** (.0154)	−0.8561*** (.0014)
POST × *INC* × E_{t+1}	0.4755* (.0570)	0.9897*** (.0001)	0.4724*** (.0043)	0.6623*** (.0099)	0.5604** (.0237)
POST × *INC* × R_{t+1}	−0.0007 (.9901)	−0.0435 (.4084)	−0.0092 (.7987)	−0.0107 (.8542)	−0.0271 (.6202)
INC	−0.0132 (.5254)	−0.0270 (.1685)	0.0037 (.7869)	−0.0199 (.3579)	−0.0122 (.5532)
INC × E_{t-1}	−0.1258 (.3413)	−0.1186 (.3439)	−0.1537* (.0796)	−0.2083 (.1334)	−0.0663 (.6150)
INC × E_t	0.3332** (.0340)	0.1809 (.2238)	0.2004* (.0541)	0.3194 (.0506)	0.4010** (.0103)
INC × E_{t+1}	0.1371 (.3273)	−0.1874 (.1587)	0.1754* (.0588)	0.1472 (.3114)	0.0716 (.6085)
INC × R_{t+1}	−0.0511* (.0914)	−0.0121 (.6769)	−0.0509** (.0112)	−0.0612* (.0599)	−0.0276 (.3680)
CTRL	0.0187*** (.0001)	−0.2700*** (.0001)	−0.7815*** (.0001)	0.0389** (.0398)	−0.0002 (.8336)
CTRL × E_{t-1}	−0.0572*** (.0001)	−0.0421 (.7045)	1.1938*** (.0001)	−0.1409 (.2953)	−0.3383*** (.0001)
CTRL × E_t	0.0830*** (.0001)	−0.6035*** (.0001)	0.2521*** (.0056)	−0.2965** (.0492)	0.1152*** (.0006)

(continued on next page)

TABLE 7 (continued)

	Control Variables				
Explan. Variables[c]	***MKT_BOOK*** **Market-to-Book Equity**	***LOSS*** **Negative Earnings**	***SIGN*** **Negative Stock Return**	***FIRM_EVAR*** **Firm-Level Earnings Variance**	***SIZE*** **Market Value of Equity**
CTRL × E_{t+1}	−0.0022	−4.1789***	0.0046	−0.8376***	0.1903***
	(.8996)	(.0001)	(.9599)	(.0001)	(.0001)
CTRL × R_{t+1}	−0.0057*	0.1707***	0.2652***	0.0562*	−0.0342***
	(.0962)	(.0001)	(.0001)	(.0670)	(.0001)
No. of Observations	5,462	5,462	5,462	5,462	5,462
Adjusted R^2	15.36	24.36	62.84	15.95	16.44
Linear restriction $b_6 + c_3 = 0$	p-value = 0.0116	p-value = 0.0001	p-value = 0.0071	p-value = 0.0081	p-value = 0.0110

---

*, **, *** Significant at the 10 percent, 5 percent, and 1 percent levels, respectively. Coefficient estimates (p-values).

[a] See Table 1 for sample information.

[b] "Pre-131 single-segment firms" denotes firms that disclose single-segments in the pre-131 era. "Pre-131 multi-segment firms" denotes firms that disclose multiple-segments in the pre-131 period.

[c] See Exhibit 1 for variable definitions.

several control variables does not affect our prior conclusion that pre-131 single-segment firms experienced no temporal shift in FERC. Most important, both Tables 4 and 7 show that pre-131 single-segment firms that increased their numbers of disclosed segments exhibit positive shifts in FERC after SFAS No. 131 adoption (see coefficients for $POST \times INC \times E_{t+1}$).[25]

VIII. CONCLUSION

We investigate the effect of firms' adoption of SFAS No. 131 segment disclosure rules on the stock market's ability to predict the firms' earnings, which we refer to as stock price informativeness. We measure informativeness by the forward earnings response coefficient (FERC), the association between current-year returns and next-year earnings. SFAS No. 131, effective for fiscal years beginning after December 15, 1997, arguably increased both the quantity and quality of segment disclosure.

We find that pre-131 multi-segment firms experienced a significant increase in FERC after adopting SFAS No. 131, regardless of whether they increased their number of reported business segments. This indicates that SFAS No. 131 achieved one of its intended effects: to increase the quality of reported information for multi-segment firms. We also find that many pre-131 single-segment firms increased their disaggregation of segment data under SFAS No. 131, and the larger of these firms experienced an increase in FERC. Our use of control firms (single-segment firms that were unaffected by SFAS No. 131) provides assurance that the results are not due to some other event(s) concurrent to the adoption of SFAS No. 131. These results are robust under numerous procedures that control for characteristics of the sample firms and their earnings, providing strong evidence that SFAS No. 131 resulted in an increase in stock price informativeness both for multi-segment firms and for single-segment firms that became multi-segment. Thus, our results provide the first empirical price-based evidence that SFAS No. 131 provided more information (about future earnings) to the market, as the standard's proponents have suggested.

Perhaps as important as our results, this is the first study to examine the consequences of a mandated accounting change in terms of its affects on the amount of information (about future earnings) reflected in stock prices. Thus, this paper represents a new approach to studying the effects of (changes in) accounting standards, which can be applied to other standards.

APPENDIX

Qualitative Improvements in Disclosure under SFAS No. 131

This appendix provides a discussion of qualitative improvements in segment information, under SFAS No. 131, that likely improved the ability of analysts and investors to forecast future earnings and cash flows. By "qualitative" we mean all improvements other than increased disaggregation (greater numbers) of reported business segments, although some of these provisions resulted in increases in the numbers of data items reported.

Incremental Information Provided by SFAS No. 131

A comparison of the requirements of SFAS No. 131 with those of SFAS No. 14 suggests that the current standard provides incremental, useful information in the following areas.

---

[25] In unreported results, we also control for the effect of losses in period t, and our conclusions are strongly supported. We also re-estimate the regressions in Tables 6 and 7 using all control variables together in one regression, and our conclusions remain unchanged.

1. SFAS No. 131 requires that an operating segment be defined as a component of an enterprise whose operating results are regularly reviewed by the enterprise's Chief Operating Decision Maker (CODM), to make decisions about resources to be allocated to the segment and assess its performance (para. 10). SFAS No. 131 states that, consequently, the segments are evident from the structure of the enterprise's internal organization (para. 4).
2. SFAS No. 131 requires that reported segment profit or loss correspond to the measure of segment profit or loss reviewed by the CODM (para. 30). This measure does not necessarily need to be the GAAP measure, as long as it is the one used by the CODM. This further emphasizes the decision usefulness of the segment information to be provided under SFAS No. 131 as opposed to SFAS No. 14. Additional requirements related to segment income include the following.
    a. SFAS No. 131 requires that managers separately report interest revenue and interest expense amounts, for nonfinancial segments, if these amounts are included in the measure of segment profit or loss reviewed by the CODM (para. 27).
    b. SFAS No. 131 requires disclosure of extraordinary items, if the amounts are included in the measure of segment profit or loss reviewed by the CODM (para. 27).
    c. SFAS No. 131 requires disclosure of income tax expense or benefit, if the amounts are included in the measure of segment profit or loss reviewed by the CODM (para. 27).
    d. SFAS No. 131 requires disclosure of significant non-cash items, other than depreciation, depletion, and amortization, if the amounts are included in the measure of segment profit or loss reviewed by the CODM (para. 27).
3. SFAS No. 131 specifies criteria under which similar operating segments may/may not be aggregated (para. 17).
4. SFAS No. 131 specifies criteria under which an enterprise may/may not combine information about material operating segments with information about immaterial operating segments to produce an aggregated reportable segment (para. 19)

Summary of SFAS No. 14 with Regard to the Items Above

1. SFAS No. 14 required that an operating segment be defined as a component of an enterprise engaged in providing a product or service or a group of related products and services, primarily to unaffiliated customers, for a profit. SFAS No. 14 stated that determination of an enterprise's industry segments must depend to a considerable extent on the judgment of the management of the enterprise.
2. SFAS No. 14 defined reported segment profit or loss by defining segment revenues and expenses. SFAS No. 14 did not require the disclosures of segment income items described in 2a through 2d above.
3. SFAS No. 14 did not specify criteria under which segments producing similar products or services may/may not be aggregated.
4. SFAS No. 14 did not specify criteria under which an enterprise may/may not combine information about material operating segments with information about immaterial operating segments to produce an aggregated reportable segment.

Summary of SFAS No. 131 Qualitative Improvements

The most important qualitative improvement under SFAS No. 131, in our view, consists of the implementation of the "management approach" to identifying reportable segments, mentioned in item 1 above. In its 1993 white paper, the AIMR stated (Knutson 1993, 5), "We believe that segment data are most useful when they depict the way in which the enterprise itself is organized and managed ..." In 1996 the AIMR's letter, responding to the FASB's exposure draft that preceded SFAS No. 131, stated, "Disaggregated information based on the management approach should provide analysts with valuable insights into the source of past, present, and *future* earnings as well as a better understanding of risk factors" (emphasis added).

SFAS No. 131's goal, as summarized in the standard, is not specifically to force companies to provide more disaggregated information, but rather to improve the quality and quantity of information about how a company is managed (para. 51):

> Key characteristics of the new approach were that (a) information would be provided about segments of the enterprise that corresponded to the structure of the enterprise's internal organization, that is, about the divisions, departments, subsidiaries, or other internal units that the chief operating decision maker uses to make operating decisions and to assess an enterprise's performance, (b) specific amounts would be allocated to segments only if they were allocated in reports used by the chief operating decision maker for evaluation of segment performance, and (c) accounting policies used to produce the disaggregated information would be the same as those used in the reports used by the chief operating decision maker in allocating resources and assessing segment performance.

REFERENCES

Agrawal, A. and S. Chadha. 2003. Who is afraid of Reg FD? The behavior and performance of sell-side analysts following the SEC's fair disclosure rules. Unpublished manuscript, The University of Alabama.

Atiase, R. 1985. Predisclosure information, firm capitalization, and security price behavior around earnings announcements. *Journal of Accounting Research*: 21–36.

Ayres, B., and R. Freeman. 2001. Evidence that analyst following and institutional ownership accelerate the pricing of future earnings. *Review of Accounting Studies*: 47–67.

Basu, S. 1997. The conservatism principle and the asymmetric timeliness of earnings. *Journal of Accounting and Economics*: 3–37.

Berger, P., and R. Hann. 2003. The impact of SFAS 131 on information and monitoring. *Journal of Accounting Research*: 163–222.

Collins, D. W., S. P. Kothari, J. Shanken, and R. Sloan. 1994. Lack of timeliness and noise as explanations for the low contemporaneous return-earnings association. *Journal of Accounting and Economics*: 289–324.

Durnev, A., R. Morck, B. Yeung, and P. Zarowin. 2003. Does greater firm-specific return variation mean more or less informed stock pricing? *Journal of Accounting Research*: 797–836.

El-Gazzar, S. 1998. Predisclosure information and institutional ownership: A cross-sectional examination of market revaluations during earnings announcement periods. *The Accounting Review*: 119–129.

Ettredge, M., S. Y. Kwon, and D. Smith. 2002. Competitive harm and companies' positions on SFAS No. 131. *Journal of Accounting Auditing and Finance*: 93–109.

———, ———, ———, and M. Stone. 2004. The effect of SFAS No. 131 on the cross-segment variability of profits reported by multiple segment firms. Unpublished manuscript, University of Kansas.

Financial Accounting Standards Board (FASB). 1975. *Financial Reporting for Segments of a Business Enterprise.* Statement of Financial Accounting Standards No. 14. Norwalk, CT: FASB.

———. 1985. *Objectives of Financial Reporting by Business Enterprises.* Statement of Financial Accounting Concepts No. 1. Stamford, CT: FASB.

———. 1996. *Exposure Draft: Proposed Statement of Financial Accounting Standards: Reporting Disaggregated Information about a Business Enterprise.* Financial Accounting Series. Stamford, CT: FASB.

———. 1997. *Disclosure about Segments of an Enterprise and Related Information.* Statement of Financial Accounting Standards No. 131. Stamford, CT: FASB.

Gelb, D., and P. Zarowin. 2002. Corporate disclosure policy and the informativeness of stock prices. *Review of Accounting Studies*: 33–52.

Heflin, F., K. R. Subramanyam, and Y. Zhang. 2003. Regulation FD and the financial information environment: Early evidence. *The Accounting Review*: 1–37.

Herrmann, D., and W. Thomas. 2000. An analysis of segment disclosures under SFAS No. 131 and SFAS No. 14. *Accounting Horizons*: 287–302.

Jiambalvo, J., S. Rajgopal, and M. Venkatachalam. 2002. Institutional ownership and the extent to which stock prices reflect future earnings. *Contemporary Accounting Research*: 117–145.

Kim, O., and R. E. Verrecchia. 1991. Trading volume and price reactions to public announcements. *Journal of Accounting Research*: 302–321.

———, and ———. 1994. Market liquidity and volume around earnings announcements. *Journal of Accounting and Economics*: 41–67.

Knutson, P. H. 1993. *Financial Reporting in the 1990s and Beyond.* Charlottesville, VA: Association for Investment Management and Research.

Liu, J., and J. Thomas. 2000. Stock returns and accounting earnings. *Journal of Accounting Research*: 71–101.

Lundholm, R., and L. Myers. 2002. Bringing the future forward: The effect of disclosure on the returns-earnings relation. *Journal of Accounting Research*: 809–839.

Maines, L., L. McDaniel, and M. Harris. 1997. Implications of proposed segment reporting standards for financial analysts' investment decisions. *Journal of Accounting Research* (Supplement): 1–24.

Piotroski, J., and D. Roulstone. 2004. The influence of analysts, institutional investors, and insiders on the incorporation of market, industry, and firm-specific information into stock prices. *The Accounting Review*: 1119–1151.

Shane, P., N. Soderstrom, and S. Yoon. 2001. Earnings and price discovery in the Post-Reg. FD information environment: A preliminary analysis. Unpublished manuscript, University of Colorado.

Street, D., N. Nichols, and S. Gray. 2000. Segment disclosures under SFAS No. 131: Has business segment reporting improved? *Accounting Horizons*: 259–285.

Tobin, J. 1982. On the efficiency of the financial system. *Lloyd's Banking Review* (July).

Venkataraman, R. 2001. The Impact of SFAS 131 on financial analysts' information environment. Unpublished manuscript, University of Minnesota.

THE ACCOUNTING REVIEW
Vol. 80, No. 3
2005
pp. 805–823

Rounding of Analyst Forecasts

Don Herrmann
Baylor University

Wayne B. Thomas
University of Oklahoma

ABSTRACT: We find that analyst forecasts of earnings per share occur in nickel intervals at a much greater frequency than do actual earnings per share. Analysts who round their earnings per share forecasts to nickel intervals exhibit characteristics of analysts who are less informed, exert less effort, and have fewer resources. Rounded forecasts are less accurate and the negative relation between rounding and forecast accuracy increases as the rounding interval increases from nickel to dime, quarter, half-dollar, and dollar. An examination of announcement period returns reveals that market expectations more closely align with consensus forecasts including rounded forecasts and then correct toward the more accurate consensus forecasts excluding rounded forecasts. Finally, exclusion of rounded forecasts decreases forecast dispersion.

Keywords: *heaping; rounding; analyst forecast accuracy; dispersion.*

I. INTRODUCTION

We find that analysts' earnings per share forecasts occur at nickel intervals approximately 55 percent of the time. This rate is much greater than expected based either on the frequency of actual earnings, which occur at nickel intervals 22.75 percent of the time, or on a random distribution (i.e., 20 percent of the time).[1] The frequency of forecasted earnings at nickel intervals is 2.75 (i.e., 55 percent/20 percent) times greater

---

[1] The expectation that 20 percent of earnings per share should round to nickel intervals if earnings occur at random is not entirely accurate based on Benford's law (Benford 1938). Benford's law suggests that when earnings per share is less than \$1.00, the probability of the pennies digit being equal to a 0 or 5 is 21.7 percent. When earnings per share is greater than or equal to \$1.00 and less than \$10.00, Benford's law predicts the pennies digit to equal a 0 or 5 for 20.16 percent of the observations. When earnings per share is greater than or equal to \$10.00 and less than \$100.00, Benford's law predicts the pennies digit to equal a 0 or 5 for 20.02 percent of the observations. Therefore, the expected frequency at nickel intervals based on Benford's law should be a weighted average of these expectations. As a practical matter, most annual earnings per share observations lie between \$1.00 and \$10.00, so the expectation based on Benford's law will be very close to the simpler expected value of 20 percent. We use the simpler expectation for ease of exposition.

We thank Huong Higgins, Joe Rodgers, Senyo Tse, Beverly Walther, two anonymous reviewers, and workshop participants at Baylor University, Oklahoma State University, Oregon State University, and The University of Texas at San Antonio for many helpful comments. The authors gratefully acknowledge the contribution of Thomson Financial for providing earnings per share forecast data, available through the Institutional Brokers Estimate System. This data is provided as part of a broad academic program to encourage earnings expectations research.

Editor's note: This paper was accepted by Larry Brown, Editor.

Submitted July 2003
Accepted October 2004

than expected. We investigate whether rounding relates to the analyst's level of informativeness. Individuals may round to common numerical intervals when they lack precise information. For example, suppose two persons were asked the driving distance from Los Angeles to New York City. If the first person answered 3,000 miles and the second person answered 2,824 miles, it is likely that the latter provides the more informed answer.[2]

Prior research has labeled the phenomenon of rounding one's answer to a common interval as "heaping." Originating in the field of demography and subsequently spreading to areas as diverse as economics, healthcare, psychology, sociology, and statistics, heaping represents a common type of measurement error found in discrete quantitative data based on subject responses or observer assessments. For example, respondents tend to heap in intervals of five in estimating the number of individuals having a particular characteristic in their personal network (Roberts and Brewer 2001; McCarty et al. 2001). This may lead to incorrect assessments in estimating the size of hard-to-count subpopulations, such as those who are HIV positive or homeless.

We observe the phenomenon of heaping for analyst forecasts of annual earnings per share. The top (bottom) graph in Figure 1 displays the frequency for the last two digits of reported (forecasted) annual earnings per share in the unadjusted I/B/E/S data over the period 1985–2001. The forecasts are the last forecast in each year for each analyst-firm pair. In comparison to reported earnings, the frequency of observations at nickel intervals is much greater for analyst forecasts. Sharp increases in the frequency of analyst forecasts occur at every nickel interval.[3] For reported earnings, the frequency is relatively constant across intervals, with only a slight tendency to report earnings per share in nickel intervals.[4]

We first investigate individual analyst characteristics associated with the choice to round an earnings forecast. We find that analysts are less likely to provide a rounded forecast when they have greater prior forecast accuracy, are at larger brokerage firms, and forecast more frequently. Analysts with more firm experience, a longer forecast horizon, and those who follow more firms and industries are more likely to provide a rounded forecast. Second, we examine the forecast accuracy of analysts who round and those who do not. We find that rounded forecasts are significantly less accurate than non-rounded forecasts. Based on a correlation of announcement period returns with earnings surprise, we find that capital market expectations are more closely associated with consensus forecasts that include rounded forecasts. In addition, the measurement error induced by rounding is related to abnormal returns during earnings announcements, suggesting that market participants do not fully incorporate characteristics of analysts that round. Third, we investigate the relation between rounding and forecast dispersion. Prior research argues *ex ante* uncertainty can be measured using dispersion of earnings forecasts (e.g., Barron et al. 1998; Diether et al. 2002). Greater dispersion implies greater uncertainty. We find that excluding rounded forecasts from the analysis significantly reduces forecast dispersion, consistent with the view that analysts who round have less precise information.

---

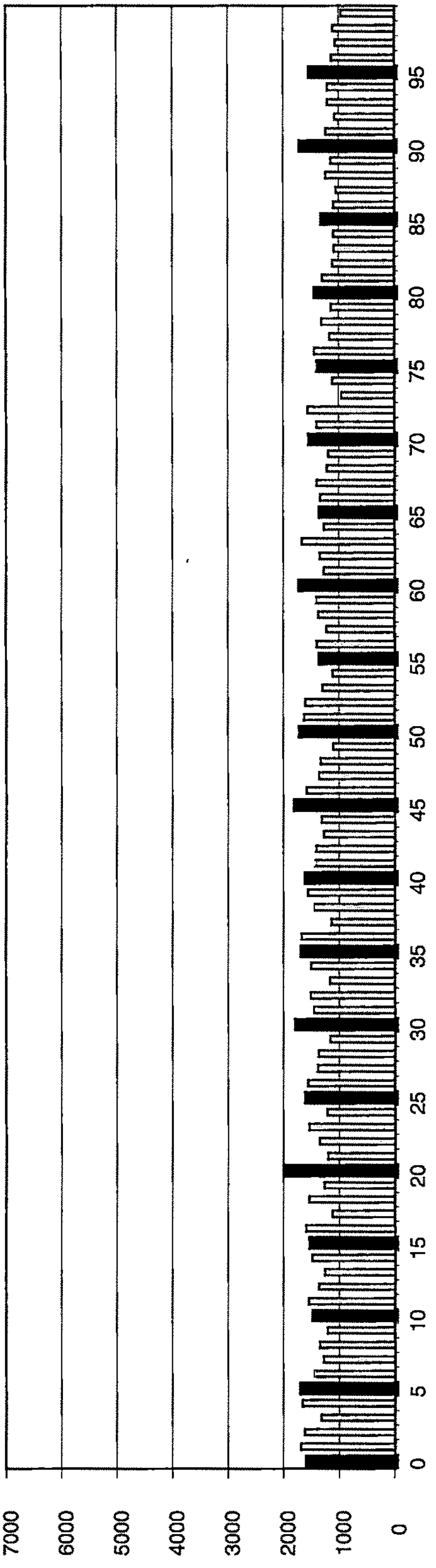
[2] The *Rand McNally: Road Atlas '03* reports the driving distance between New York City and Los Angeles as 2,824 miles.

[3] Not all forecasts reported in nickel intervals are necessarily rounded. An analyst that forecasts to a nickel interval may expect earnings to precisely equal that nickel interval. The error in measuring rounded forecasts as all forecasts reported in a common interval reduces the power of our tests to determine whether rounded forecasts exhibit characteristics of less informed analysts.

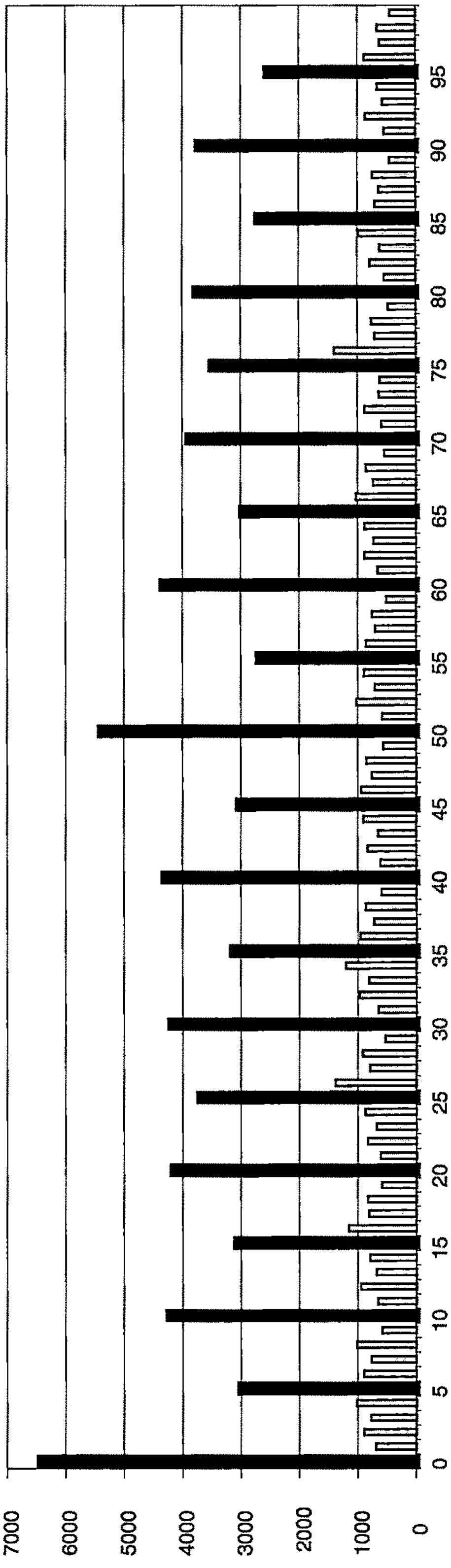
[4] Thomas (1989) finds more zeros and fewer nines than would be expected in the second-from-left-most digit in actual reported earnings for firms reporting profits and the opposite pattern for firms reporting losses. Das and Zhang (2003) find that this rounding-up of reported earnings is related to earnings management activities.

FIGURE 1
Histograms of the Last Two Digits of Reported and Forecasted Earnings Per Share
(Analyst/Firm/Years = 136,323)

Last Two Digits of Reported Earnings Per Share



Last Two Digits of Forecasted Earnings Per Share



An examination of the properties of analyst forecasts is important because analysts play a significant role as information intermediaries in the functioning of capital markets. A large body of research shows that analyst forecasts are useful for investment decisions.[5] However, prior research also documents many instances in which financial analysts do not process publicly available information efficiently in forming earnings expectations.[6] Users of analyst forecasts can benefit by knowing the extent to which individual analyst forecasts can be relied upon to accurately predict the firm's future performance (Schipper 1991; Clement and Tse 2003; Mikhail et al. 2003). Prior research has identified superior analysts based on certain analyst-specific characteristics (e.g., Mikhail et al. 1997; Clement 1999; Jacob et al. 1999; Brown 2001a; Clement et al. 2003; Clement and Tse 2003). These studies focus primarily on characteristics of individual analysts (e.g., prior accuracy, frequency of forecasting, experience, forecast horizon, and number of firms followed) or their brokerage firm (e.g., size, industry specialization, and turnover) and do not consider rounding. Our findings facilitate the understanding of the extent to which analyst forecast properties are associated with rounding.

We contribute to the analyst forecast literature by showing that analyst forecasts are affected by a behavioral bias (i.e., heaping). Our results suggest that those analysts who exhibit heaping provide less accurate forecasts and display characteristics of less informed, lower effort analysts. Future research may wish to explore alternative behavioral biases affecting analysts and the accuracy of their forecasts, and the extent to which users' decisions may have been impaired by failure to understand the effects of these biases on analyst forecasts.

We proceed as follows. Section II discusses prior literature and develops hypotheses. Section III describes sample selection and measurement of our dependent and independent variables. Section IV discusses the empirical results and Section V concludes.

II. RELATED LITERATURE AND HYPOTHESES DEVELOPMENT

An extensive body of literature addresses rounding issues under the topic of heaping. Heaping is often found in discrete quantitative data provided by subject reports or observer assessments. Examples of heaping research include estimates of personal network size (McCarty et al. 2001; Roberts and Brewer 2001), job tenure (Ureta 1992), unemployment duration (Torelli and Trivellato 1993), current weight (Rowland 1990), length of breastfeeding (Singh et al. 1994), smoking (Brown et al. 1998), elapsed time (Huttenlocher et al. 1990), blood pressure (Wen et al. 1993), and ultrasound measures (Wright and Bray 2003). The research focuses on data imprecision due to heaping and statistical approaches for treating heaped data (e.g., Hobson 1976; Heitjan 1994; Singh et al. 1994; Roberts and Brewer 2001). Heaping likely reflects one or more cognitive processes. Individuals may choose culturally defined "round" or "even" numbers as responses in providing estimates. This tendency is called digit preference when the heaped values correspond to a limited set of terminal digits. In other cases, heaping may be due to computing a rate of occurrence and multiplying this rate by some other measurement unit such as a time period. Heaping will then exhibit itself in multiples of the other measurement unit (i.e., time periods).

---

[5] Analyst forecasts are commonly used as measures of market expectations (Brown 1993). The empirical evidence of the relation between market returns and forecast error extends from earlier studies (e.g., Brown et al. 1987a) to more recent studies (e.g., Bartov et al. 2002; Kinney et al. 2002; Brown and Caylor 2005; Payne and Thomas 2005). Empirical research also finds that the market reacts to forecast revisions (e.g., Gleason and Lee 2003).

[6] Previous research provides evidence that analysts do not efficiently process information in past earnings (Abarbanell and Bernard 1992; Ali et al. 1992), extreme past earnings changes (Easterwood and Nutt 1999), prior forecast errors (Mendenhall 1991), forecast errors of related firms (Ramnath 2002), forecast revisions (Elliott et al. 1995; Gleason and Lee 2003), and past stock returns (Abarbanell 1991).

If analysts engage in data heaping, then forecasts of earnings per share should occur more frequently at common currency units (e.g., nickel intervals). Analysts spend time and resources to gather information regarding the firm's future earnings. When analysts do not derive a precise forecast (i.e., to the penny), they are more likely to provide a rounded response. Reported earnings per share, on the other hand, are not based on observer assessment. Free from any management manipulation, one would not expect reported earnings per share to reflect a behavioral bias toward rounding. We hypothesize that rounding will occur more frequently in analyst forecasts than in reported earnings.

H1: Rounded analyst forecasts occur more frequently than expectations based on reported earnings per share.

Analyst Characteristics and Forecast Accuracy

Prior literature has identified analyst and brokerage firm characteristics associated with individual analyst forecast accuracy (Mikhail et al. 1997; Clement 1999; Jacob et al. 1999; Brown 2001a; Brown and Mohd 2003; Clement and Tse 2003). Past accuracy, brokerage firm size, forecast frequency, and firm experience are related positively to forecast accuracy, while forecast horizon, number of firms followed, and number of industries followed are related negatively to forecast accuracy. We extend these research findings by examining whether analyst characteristics are associated with heaping.

One commonality of the research on heaping is that reported data contain greater measurement error when individuals round to common amounts. If financial analysts are similarly affected by heaping, then there should be greater measurement error (i.e., forecast error) at common currency intervals. Analysts have economic incentives to provide accurate forecasts (Mikhail et al. 1999; Hong and Kubik 2003) and they attempt to improve forecast accuracy by gathering and processing information throughout the period (Brown et al. 1987a; O'Brien 1988; Brown and Kim 1991; Brown and Mohd 2003). However, gathering and processing information is a costly endeavor and some analysts may provide less informed forecasts when the incremental cost of increased forecast accuracy outweighs the incremental benefit.[7] For instance, analysts at smaller brokerage firms are not privy to the same set of information, restricting their ability to provide more accurate forecasts. Furthermore, analysts at smaller brokerage firms tend to have less industry specialization, hindering their ability to provide accurate forecasts (Clement 1999). Compared to analysts at larger brokerage firms, analysts at smaller brokerage firms are more likely to incur relatively higher costs to gather information to provide an equally accurate forecast and therefore more likely to provide less precise forecasts. Analysts following more companies have less time and resources to devote to forecasting each company's earnings so their forecasts are likely to be less precise.

Less informed analysts should be identified based on the behavioral bias to round (i.e., heap) their forecasts to common numerical intervals. The heaping literature predicts that analyst forecasts occurring at nickel intervals contain more measurement error (i.e., forecast error) than forecasts occurring at non-nickel intervals. Analysts with less firm-specific information about future earnings are more likely to heap their forecasts. We hypothesize that analysts who round will exhibit characteristics associated with less informed analysts, based on variables shown in prior research. We also hypothesize that they will provide less accurate forecasts.

---

[7] One potential benefit that could be derived from more accurate forecasts is the additional revenue generated from increased trading of stocks covered by the analyst's brokerage firm. A brokerage firm's trading volume is significantly greater for stocks covered by its analysts (Irvine 2000).

H2: Rounded analyst forecasts are associated with characteristics of less informed analysts.

H3: Rounded analyst forecasts are less accurate than non-rounded analyst forecasts.

Forecast Dispersion

Forecast dispersion is defined as the standard deviation of analysts' final forecasts for the company in that year scaled by the absolute value of actual earnings. Forecast dispersion has commonly been used as a measure of uncertainty with respect to the firm's information environment (Imhoff and Lobo 1992; Ackert and Athanassakos 1997; Barron et al. 1998; Payne and Robb 2000; Diether et al. 2002; Kinney et al. 2002; Hope 2003). Greater dispersion indicates less agreement among analysts regarding expected earnings due to the inability or unwillingness of some analysts to fully and objectively gather and process information. Analysts expending greater resources or effort to obtain more precise information to forecast earnings are more likely to be in agreement. Exclusion of forecasts from less informed analysts should result in greater agreement among the remaining informed analysts, resulting in lower forecast dispersion.[8]

H4: Dispersion in analyst forecasts is lower when rounded forecasts are excluded.

III. SAMPLE SELECTION AND VARIABLE MEASUREMENT

Sample Selection Criteria

We obtain analyst forecast data from the I/B/E/S Detail Files that are not split-adjusted and therefore do not suffer from the retroactive stock-split rounding effect addressed in Baber and Kang (2002) and Payne and Thomas (2003). Our initial sample includes annual earnings forecasts from 1985 through 2001. Consistent with prior research (O'Brien 1990; Sinha et al. 1997; Clement and Tse 2003) we examine only the last forecast for each analyst-firm pair. I/B/E/S forecasts are issued by both individual analysts and analyst teams. We eliminate all team forecasts based on a review of the Broker Translation file received from I/B/E/S that links analyst codes with their identities.[9] We delete observations where fewer than three analysts follow a firm in a given year or the forecast horizon in the current or the previous year is less than ten or more than 300 calendar days from the earnings announcement.[10] Analyst characteristics are measured relative to other analysts following the firm in the same year. We require that each firm have at least one analyst who rounds and another who does not round in a given year. These criteria result in a sample size of 136,323 forecasts over the period 1985–2001.

---

[8] The hypothesis that rounded forecasts are less accurate (H3) does not directly lead to the hypothesis that exclusion of rounded forecasts decreases forecast dispersion (H4). If a sufficient number of rounded forecasts cluster away from reported earnings, then rounded forecasts will be less accurate, yet overall forecast dispersion could be lower. A related issue is whether rounding analysts herd toward the consensus forecast. We find that rounding analysts are more likely to herd and increase forecast dispersion. One possible reason for this finding is that rounding analysts may revise more often toward the consensus but revise to different rounded intervals. Non-rounding analysts who expend more effort are more likely to issue timelier forecasts and have greater agreement. In addition, better-informed, non-rounding analysts do not necessarily revise toward the consensus, which can be significantly affected by the forecasts of lesser informed, less timely rounding analysts that tend to take more extreme positions. We address the relation between rounding and herding in sensitivity tests reported later in the paper.

[9] Our results are similar if we keep team forecasts in our sample.

Variable Measurement

To facilitate comparisons of estimated coefficients and to control for the effects of outliers, we standardize all variables as in Clement and Tse (2003). The values for each variable are standardized to lie between 0 and 1 by computing the difference between the observed value and minimum value (or the difference between the maximum value and the observed value), divided by the range computed as the maximum minus the minimum value. The absolute magnitudes of the regression coefficients indicate the explanatory variables' relative importance. Forecast accuracy is calculated so that values closer to 1 represent greater forecast accuracy (lower absolute forecast error) and values closer to 0 represent lower forecast accuracy (greater absolute forecast error). The regression model examined is:

$$\begin{aligned} Accuracy_{ijt} = {} & \alpha_0 + \alpha_1 Lag\_Accuracy_{ijt} + \alpha_2 Broker\_Size_{ijt} + \alpha_3 For\_Frequency_{ijt} \\ & + \alpha_4 Firm\_Experience_{ijt} + \alpha_5 For\_Horizon_{ijt} \\ & + \alpha_6 Firms\_Followed_{ijt} + \alpha_7 Industries\_Followed_{ijt} + \varepsilon_{ijt} \end{aligned}$$

where the standardized dependent and independent variables are computed as:

Dependent Variable

Accuracy = maximum absolute forecast error for analysts following firm j in year t minus the absolute forecast error of analyst i following firm j in year t, scaled by the range of absolute forecast errors for analysts following firm j in year t.

Independent Variables

Lag_Accuracy = maximum absolute forecast error for analysts following firm j in year $t-1$ minus the absolute forecast error of analyst i following firm j in year $t-1$, scaled by the range of absolute forecast errors for analysts following firm j in year $t-1$;

Broker_Size = number of analysts employed by the broker employing analyst i following firm j in year t minus the minimum number of analysts employed by brokers for analysts following firm j in year t, scaled by the range of broker size for analysts following firm j in year t;

For_Frequency = number of firm j forecasts made by analyst i in year t minus the minimum number of firm j forecasts for analysts following firm j in year t, scaled by the range of the number of firm j forecasts issued by analysts in year t;

---

[10] We obtain similar results if we require a minimum of two or four analysts for each firm/year.

Firm_Experience = number of years of firm-specific experience for analyst i following firm j in year t minus the minimum number of years of firm-specific experience for analysts following firm j in year t, scaled by the range of years of firm-specific experience of analysts following firm j in year t;

For_Horizon = number of calendar days from the forecast date to the earnings announcement date for analyst i following firm j in year t minus the minimum forecast horizon for analysts who follow firm j in year t, scaled by the range of forecast horizons for analysts following firm j in year t;

Firms_Followed = number of firms followed by analyst i following firm j in year t minus the minimum number of firms followed by analysts following firm j in year t, scaled by the range in the number of firms followed by analysts following firm j in year t; and

Industries_Followed = number of industries followed by analyst i following firm j in year t minus the minimum number of industries followed by analysts following firm j in year t, scaled by the range in the number of industries followed by analysts following firm j in year t.

Table 1 presents mean analyst characteristics after standardization. Mean accuracy is significantly lower for rounders than non-rounders. The means for lag accuracy, broker size, and forecast frequency are all higher for non-rounders, whereas the means for firm experience, forecast horizon, firms followed and industries followed are all higher for rounders. The greatest differences in means between rounders and non-rounders are reported for forecast frequency (−0.098) and forecast horizon (0.084). The direction of the mean differences generally supports an association between rounding and less informed analysts. Firm experience represents the sole exception whereby more experienced analysts are more likely to round their forecasts.

Table 2 reports correlations among the standardized analyst characteristics. The correlations are generally consistent with prior studies (e.g., Clement 1999; Clement and Tse 2003). Forecast accuracy is significantly correlated with all seven explanatory variables, being associated positively with prior accuracy, broker size, forecast frequency, and firm experience, and negatively with forecast horizon, firms followed, and industries followed. Forecast frequency has the highest positive correlation with forecast accuracy while forecast horizon has the highest negative correlation with forecast accuracy.

Among the independent variables, firms followed and industries followed are highly positively correlated (0.680), while forecast frequency and forecast horizon are highly negatively correlated (−0.461). The only other correlation between independent variables falling outside the −0.10 to 0.10 range is between broker size and industries followed (−0.178). Larger brokerage firms apparently allow analysts to have greater industry specialization.

IV. EMPIRICAL RESULTS

We begin with descriptive evidence on the prevalence of rounding. Table 1 reports that analyst forecasts of earnings per share occur at nickel intervals for 77,880 of the 136,323 observations (54.93 percent). In contrast, reported earnings (not tabulated) occur at nickel intervals for only 22.75 percent of the observations. Consistent with H1, rounded forecasts occur more frequently (2.41 times = 54.93/22.75) than expectations based on reported earnings per share. The difference in proportions is significant (p-value < .0001) based on

TABLE 1
Mean Standardized Analyst Characteristics
(Analyst/Firm/Years = 136,323)

Variable	Overall	Rounders	Non-Rounders	Difference
Accuracy	0.655	0.643	0.678	−0.035*
Lag_Accuracy	0.635	0.630	0.641	−0.011*
Broker_Size	0.357	0.348	0.368	−0.020*
For_Frequency	0.427	0.383	0.481	−0.098*
Firm_Experience	0.431	0.442	0.417	0.025*
For_Horizon	0.393	0.431	0.347	0.084*
Firms_Followed	0.365	0.372	0.355	0.017*
Industries_Followed	0.346	0.355	0.336	0.019*
Analyst Forecasts n = (%)	136,323 (100%)	74,880 (54.93%)	61,443 (45.07%)	

---

* Difference in means t-test is significant at the 1% level.

Accuracy = maximum absolute forecast error for analysts following firm *j* in year *t* minus the absolute forecast error of analyst *i* following firm *j* in year *t*, scaled by the range of absolute forecast errors for analysts following firm *j* in year *t*;
Lag_Accuracy = maximum absolute forecast error for analysts following firm *j* in year *t*–1 minus the absolute forecast error of analyst *i* following firm *j* in year *t*–1, scaled by the range of absolute forecast errors for analysts following firm *j* in year *t*–1;
Broker_Size = number of analysts employed by the broker employing analyst *i* following firm *j* in year *t* minus the minimum number of analysts employed by brokers for analysts following firm *j* in year *t*, scaled by the range of broker size for analysts following firm *j* in year *t*;
For_Frequency = number of firm *j* forecasts made by an analyst in year *t* minus the minimum number of firm *j* forecasts for analysts following firm *j* in year *t*, scaled by the range of the number of firm *j* forecasts issued by analysts in year *t*;
Firm_Experience = number of years of firm-specific experience for analyst *i* following firm *j* in year *t* minus the minimum number of years of firm-specific experience for analysts following firm *j* in year *t*, scaled by the range of years of firm-specific experience following firm *j* in year *t*;
For_Horizon = number of days from the forecast date to the fiscal year-end for analyst *i* following firm *j* in year *t* minus the minimum forecast horizon for analysts who follow firm *j* in year *t*, scaled by the range of forecast horizons for analysts following firm *j* in year *t*;
Firms_Followed = number of firms followed by analyst *i* following firm *j* in year *t* minus the minimum number of firms followed by analysts following firm *j* in year *t*, scaled by the range in the number of firms followed by analysts following firm *j* in year *t*; and
Industries_Followed = number of industries followed by analyst *i* following firm *j* in year *t* minus the minimum number of industries followed by analysts following firm *j* in year *t*, scaled by the range in the number of industries followed by analysts following firm *j* in year *t*.

a difference in means t-test. Rounding of analyst forecasts is even more prevalent for larger intervals, where the frequency of rounding is 2.75, 3.10, 3.67, and 4.14 times greater than reported earnings for dime, quarter, half-dollar, and dollar intervals, respectively.

Analyst Characteristics Explaining Rounding

Prior literature documents an association between analyst forecast characteristics and analyst forecast accuracy. We examine whether these same analyst forecast characteristics are related to an analyst's choice to round. If analysts with rounded forecasts have less specialized knowledge, rounding should be associated with those characteristics describing less accurate forecasts.

Table 3 reports the results for logistic regressions of rounding on analyst forecast characteristics. The dependent variable takes a value of 1 (0) for an analyst who rounds (does

TABLE 2
Pearson Correlations among Standardized Analyst Characteristics
(Analyst/Firm/Years = 136,323)

	Lag_ Accuracy	*Broker_ Size*	*For_ Frequency*	*Firm_ Experience*	*For_ Horizon*	*Firms_ Followed*	*Industries_ Followed*
Accuracy	0.071*	0.031*	0.190*	0.025*	−0.316*	−0.024*	−0.045*
Lag_Accuracy		0.021*	0.030*	0.002	−0.040*	−0.054*	−0.065*
Broker_Size			0.066*	0.055*	−0.007	−0.062*	−0.178*
For_Frequency				0.035*	−0.461*	0.016*	−0.023*
Firm_Experience					−0.034*	0.090*	0.045*
For_Horizon						−0.013*	0.013*
Firms_Followed							0.680*

---

* Significant at the 1 percent level.
Variable definitions are provided in Table 1.

TABLE 3
Logistic Regression of Rounding on Analyst Forecast Characteristics[a]
(Analyst/Firm/Years = 136,323)

$$\begin{aligned} Rounding_{ijt} = {} & \alpha_0 + \alpha_1 Lag\_Accuracy_{ijt} + \alpha_2 Broker\_Size_{ijt} + \alpha_3 For\_Frequency_{ijt} \\ & + \alpha_4 Firm\_Experience_{ijt} + \alpha_5 For\_Horizon_{ijt} + \alpha_6 Firms\_Followed_{ijt} \\ & + \alpha_7 Industries\_Followed_{ijt} + \varepsilon_{ijt} \end{aligned}$$

	Expected Sign	**Coefficient**	**Coefficient**
Intercept	?	0.233* (140.5)	0.240* (145.5)
Lag_Accuracy	−	−0.043* (7.6)	−0.043* (7.8)
Broker_Size	−	−0.156* (82.3)	−0.145* (68.8)
For_Frequency	−	−0.615* (1191.5)	−0.612* (1179.5)
Firm_Experience	−	0.200* (196.4)	0.206* (209.1)
For_Horizon	+	0.446* (605.5)	0.444* (601.5)
Firms_Followed	+	0.148* (74.1)	
Industries_Followed	+		0.112* (46.6)

---

* Wald Chi-square statistic (shown in parentheses) is significant at the 1 percent level.

[a] The dependent variable, rounding, in the logistic regression takes a value of 1 (0) for an analyst that rounds (does not round) her final earnings forecast for the year. The model has a Chi-square Likelihood Ratio statistic of 3,634.58 ($p < .01$). The independent variables are defined in Table 1.

not round) her final earnings forecast. Due to the high correlation between the number of industries followed and the number of firms followed (see Table 2), we include these variables separately in the model. The likelihood of rounding decreases with prior accuracy, broker size, and forecast frequency. Forecast frequency, which may be a surrogate for the amount of effort an analyst expends in obtaining new information about a firm (Clement et al. 2003), has the strongest negative relation with rounding.

The likelihood of rounding increases with firm experience, forecast horizon, firms followed, and industries followed, with forecast horizon having the strongest positive relation with rounding. Overall, with the exception of firm experience, analysts who round have the same characteristics as analysts providing less accurate forecasts.[11] The results are consistent with rounding analysts having fewer resources and expending less effort to provide forecasts.[12] In support of H2, we conclude that rounded forecasts are associated with characteristics of less informed analysts.

Forecast Accuracy

Table 4 presents coefficient estimates from a regression of forecast accuracy on analyst forecast characteristics including an indicator variable for rounded forecasts. Given the high collinearity documented earlier, results for *Firms_Followed* and *Industries_Followed* are shown separately. The sign and significance of the analyst forecast characteristics in explaining forecast accuracy are consistent with prior literature. In support of H3, after controlling for other factors related to forecast accuracy, rounded forecasts are less accurate than non-rounded forecasts.[13]

Relation with Announcement Period Returns

Prior literature examines the correlation of returns with earnings forecast errors to determine which forecasts have a stronger association with market expectations (Fried and Givoly 1982; Brown et al. 1987b). We adopt this methodology to determine whether capital market expectations better reflect a consensus including rounders ($Consensus^{IR}$) or one excluding rounders ($Consensus^{ER}$). Panel A of Table 5 presents rank correlations between announcement period returns and earnings surprises conditional on either $Consensus^{IR}$ or $Consensus^{ER}$. Returns are computed as the three-day (-1, 0, $+1$) announcement period size-adjusted return.[14] Earnings surprise is defined as actual earnings minus the consensus forecast, scaled by price two days prior to the earnings announcement. Observations are omitted if the consensus forecasts including and excluding rounded forecasts are within \$.01.[15]

---

[11] The logistic model was also estimated after including broker/year dummy variables. The decision to round may be related to brokerage houses rather than the specialized knowledge of individual analysts. All results are consistent with those reported and none of the conclusions change.

[12] There exists a significant positive relation between analyst following and the proportion of rounded forecasts (correlation = 0.137, p-value < .01). Greater analyst following may have a higher proportion of rounded forecasts due to increased herding behavior among analysts. Herding is addressed later in the paper.

[13] The coefficient on rounding is smaller than the other coefficients in the model indicating that the incremental ability of nickel rounded forecasts to explain analyst forecast accuracy is lower than the variables identified in prior research. When higher rounding intervals are considered (e.g., dime, quarter, half-dollar, and dollar), we find a substantial increase in the coefficient on rounding. Untabulated results demonstrate that the coefficient on rounding increases in magnitude to −.011, −.018, −.023 and −.028 when rounding is defined at dime, quarter, half-dollar, and dollar intervals, respectively. Thus, rounding better explains analyst forecast accuracy as the rounding interval increases.

[14] To prevent outliers from driving the differences in the returns to the two groups, returns are winsorized at the 5th and 95th percentiles.

[15] This constraint reduces the number of firm/year observations from 13,597 to 9,069.

TABLE 4
Regression of Accuracy on Standardized Analyst Characteristics[a]
(Analyst/Firm/Years = 136,323)

$$\begin{aligned} Accuracy_{ijt} = {} & \alpha_0 + \alpha_1 Lag\_Accuracy_{ijt} + \alpha_2 Broker\_Size_{ijt} + \alpha_3 For\_Frequency_{ijt} \\ & + \alpha_4 Firm\_Experience_{ijt} + \alpha_5 For\_Horizon_{ijt} + \alpha_6 Firms\_Followed_{ijt} \\ & + \alpha_7 Industries\_Followed_{ijt} + \varepsilon_{ijt} \end{aligned}$$

	Expected Sign	Coefficient	Coefficient
Intercept	?	0.717* (209.3)	0.716* (208.4)
Lag_Accuracy	+	0.055* (21.8)	0.055* (21.6)
Broker_Size	+	0.024* (8.6)	0.020* (6.9)
For_Frequency	+	0.054* (18.3)	0.053* (18.1)
Firm_Experience	+	0.013* (5.8)	0.013* (5.6)
For_Horizon	−	−0.295* (−99.7)	−0.295* (−99.6)
Firms_Followed	−	−0.027* (−9.7)	
Industries_Followed	−		−0.035* (−12.7)
Rounding[b]	−	−0.004* (−2.3)	−0.004* (−2.3)
Adj. R^2		0.108	0.108

---

* t-statistic (shown in parentheses) is significant at the 1 percent level.

[a] The dependent variable, *Accuracy*, is measured as the maximum absolute forecast error for analysts following firm *j* in year *t* minus the absolute forecast error of analyst *i* following firm *j* in year *t*, scaled by the range of absolute forecast errors for analysts following firm *j* in year *t*. The independent variables are defined in Table 1.

[b] Rounding is an indicator variable with a value of 1 (0) for a rounded (not rounded) forecast.

The results show that the correlation of returns with earnings surprises is greater for $Consensus^{IR}$. Capital market expectations more closely align with $Consensus^{IR}$, which are on average less accurate, suggesting that market participants do not fully incorporate characteristics of analysts that round. Further examination of the mean forecast horizon reveals that our results for this conclusion are conservative since the $Consensus^{ER}$ has a shorter forecast horizon (i.e., is more timely). The correlation of returns with earnings surprise is normally higher for shorter forecast horizons (Brown and Kim 1991), but the $Consensus^{IR}$ has both a longer forecast horizon and a higher correlation with announcement period returns.

We extend the correlation results to examine whether forecasts of rounding analysts have an expected directional impact on stock returns. If pre-earnings-announcement prices better reflect $Consensus^{IR}$ (as shown in Panel A of Table 5) and if rounders are less accurate (as shown in Table 4), then prices should correct toward the $Consensus^{ER}$ when earnings are announced. An average positive (negative) announcement period return when

TABLE 5
The Consensus Earnings Forecast Including and Excluding Rounded Forecasts and Their Relation with Announcement Period Returns
(Firm/Years = 9,069)

Panel A: Rank Correlations and Mean Forecast Horizon

	Correlation with Announcement Period Returns[a]	Mean Forecast Horizon
Consensus^{IR} Earnings Surprises[b]	.151	113.0
Consensus^{ER} Earnings Surprises[b]	.140	99.6

Panel B: Mean Buy-and-Hold Returns

	Returns during Announcement Period	Returns Subsequent to Announcement Period			
Trading day relative to announcement date		2 to 6	7 to 61	62 to 121	2 to 121
Consensus^{IR} > *Consensus*^{ER}	.17	.08	1.97	−1.20	.68
Consensus^{IR} < *Consensus*^{ER}	.35	.05	1.67	−1.00	.75
Difference	−.18*	.03	.30	−.20	−.07

Panel C: Median Buy-and-Hold Returns

	Returns during Announcement Period	Returns Subsequent to Announcement Period			
Trading day relative to announcement date		2 to 6	7 to 61	62 to 121	2 to 121
Consensus^{IR} > *Consensus*^{ER}	−.02	−.09	1.01	−1.38	−.49
Consensus^{IR} < *Consensus*^{ER}	.16	−.04	1.02	−1.12	−.04
Difference	−.18*	−.05	− .01	− .26	−.45

---

* Difference in means t-test (or difference in medians Wilcoxon test) is significant at the 5 percent level.

[a] Represents the mean three-day (−1, 0, +1) announcement period size-adjusted return.

[b] Consensus Earnings Surprise is defined as: (Actual EPS − Consensus Forecast of EPS)/Price at day −2, where day 0 is the earnings announcement date. *Consensus*$^{IR\,(ER)}$ is the consensus forecast of EPS including (excluding) rounders.

Consensus^{IR} is smaller (greater) than *Consensus*^{ER} is consistent with prices moving upward (downward) to the more accurate forecasts of non-rounding analysts.

Panel B (Panel C) of Table 5 reports the mean (median) three-day announcement period size-adjusted returns. The mean and median announcement period returns are significantly greater (p-value < 0.01) when *Consensus*^{IR} is less than *Consensus*^{ER}, consistent with prices first reflecting *Consensus*^{IR} and then correcting toward *Consensus*^{ER} when earnings are announced. We examine drift in stock returns subsequent to the earnings announcement, where the drift period is the 120 trading days, +2 to +121. Results are shown for three post-announcement intervals, days 2 to 6, days 7 to 61, and days 62 to 121, because Bernard and Thomas (1989) show that a proportionately larger amount of the drift occurs in the five days following the earnings announcement and that drift ceases within 120 days for most firms. None of the differences in returns is significant in the post-earnings announcement period. Significant differences occur only during the three-day period surrounding the earnings announcement, suggesting that investors correct fully for any mispricing without a delayed response.

Forecast Dispersion

The impact on forecast dispersion is determined by making pair-wise comparisons of forecast dispersion including rounded forecasts ($Dispersion^{IR}$) versus excluding rounded forecasts ($Dispersion^{ER}$). Forecast dispersion is measured as the standard deviation of the final individual analysts' forecasts for a firm in a given year. Table 6 reports the results comparing mean forecast dispersion. Panel A presents findings for unscaled forecast dispersion, and Panel B provides results for forecast dispersion scaled by the absolute value of earnings per share.[16] Panels A and B reveal that forecast dispersion decreases with exclusion of rounded forecasts. Panel A shows the mean of $Dispersion^{IR}$ and $Dispersion^{ER}$ to be 0.166 and 0.133 respectively, which are significantly different ($t = 17.41$), indicating that rounders do not tend to cluster with non-rounders. Rather, they exhibit behavior consistent with less specialized knowledge or expending less effort in providing forecasts.[17] These results support our H4 that forecast dispersion is lower when rounded forecasts are excluded.

One potentially confounding result in Table 6 is the difference in mean forecast horizons. The mean forecast horizon including rounders ($Forecast\ Horizon^{IR}$) is 114.62 days, whereas the mean forecast horizon excluding rounders ($Forecast\ Horizon^{ER}$) is only 102.60 days. The greater forecast dispersion including rounders could occur because rounded forecasts are provided on a less timely basis. To mitigate this concern, we separate our sample into two groups. The first group consists of all firm-year observations where $Forecast\ Horizon^{IR}$ and $Forecast\ Horizon^{ER}$ are within 15 days of each another, allowing for a test of differences in forecast dispersion while reducing the effects of differences in forecast horizon. As a result of this constraint the difference in mean forecast horizon decreases from about 12 days to about one day. The second group consists of all observations where $Forecast\ Horizon^{IR}$ and $Forecast\ Horizon^{ER}$ are not within 15 days of each other. These results are shown in the second and third columns of Table 6. For the first group, wherein the mean difference in forecast horizons is approximately one day, $Dispersion^{IR}$ is significantly greater than $Dispersion^{ER}$, suggesting that forecast timeliness does not drive our dispersion results.[18]

Additional Tests

Frequency of Rounding over Time

We compute the frequency of rounded forecasts and rounded actual earnings for each of the 17 years in our test period. The untabulated results show a significant temporal

---

[16] The slightly smaller sample size in Panel B is due to deleting observations with an absolute value of earnings per share less than 0.10 to avoid very small numbers in the denominator.

[17] This result is conservative because the standard deviation of analyst forecasts normally increases as sample size decreases (Ziebart 1990). All else equal, the consensus excluding rounders has a higher standard deviation due to fewer analyst forecasts used in calculating dispersion.

[18] Although the mean difference in forecast horizons is about one day, this difference is statistically significant. As an additional test, we restrict the difference in $Forecast\ Horizon^{IR}$ and $Forecast\ Horizon^{ER}$ to be less than five days. With this restriction, the mean difference in forecast horizons is no longer significant, while the mean difference in forecast dispersion remains significant at the .01 level.

TABLE 6

Comparison of Forecast Dispersion Including and Excluding Rounded Forecasts (Firm/Years = 11,622)

Panel A: Mean Forecast Dispersion (Unscaled)[a]

	All	*Forecast Horizon^{IR}* within 15 days of *Forecast Horizon^{ER}*	*Forecast Horizon^{IR}* *Not* within 15 days of *Forecast Horizon^{ER}*
Firm-years	11,622	5,422	6,200
Dispersion^{IR}	0.166	0.150	0.180
Dispersion^{ER}	0.133	0.137	0.130
Difference	0.033*	0.013*	0.050*
(t-statistic)	(17.41)	(7.08)	(16.01)
Forecast Horizon^{IR}	114.62	107.12	118.72
Forecast Horizon^{ER}	102.60	106.00	99.72

Panel B: Mean Forecast Dispersion (Scaled)[b]

	All	*Forecast Horizon^{IR}* within 15 days of *Forecast Horizon^{ER}*	*Forecast Horizon^{IR}* *Not* within 15 days of *Forecast Horizon^{ER}*
Firm-years	11,364	5,298	6,066
Dispersion^{IR}	0.152	0.142	0.162
Dispersion^{ER}	0.121	0.129	0.114
Difference	0.031*	0.013*	0.048*
(t-statistic)	(16.31)	(5.70)	(15.86)
Forecast Horizon^{IR}	114.55	107.09	118.58
Forecast Horizon^{ER}	102.49	105.97	99.53

* t-test of the mean difference is significant at the 1 percent level.

[a] Dispersion is measured as the standard deviation of the final individual analysts' forecasts for a firm in a given year. *Dispersion^{IR}* (*Dispersion^{ER}*) signifies dispersion including (excluding) rounded forecasts. *Forecast Horizon^{IR}* (*Forecast Horizon^{ER}*) signifies the mean forecast horizon of all forecasts including (excluding) rounders used in calculating dispersion.

[b] Dispersion is scaled by the absolute value of earnings per share. Observations with an absolute value of earnings per share less than 0.10 are eliminated to avoid very small numbers in the denominator.

decrease in the frequency of analysts who round and an insignificant temporal decrease in the rounding of actual earnings.[19] Even with the decrease, rounded forecasts continue to occur at more than twice the frequency of rounded actual earnings. Using only the most recent three years of the sample, we obtain similar results to those reported for the full sample.

Frequency of Rounding across Industries

We next consider the prevalence of rounded forecasts across industries. Firms are classified into 11 sectors identified by I/B/E/S. For all industry sectors, the ratio of rounded forecasts to rounded actual earnings is much greater than 1, suggesting that analyst rounding is widespread and is not concentrated in a few industries. There is, however, considerable variation across industries in the extent of rounded forecasts.[20] Industries with the lowest ratio of rounded forecasts to rounded reported earnings are technology (1.90), healthcare (2.00), and consumer services (2.13). Industries with the highest ratio include transportation (3.45), public utilities (3.02), finance (2.90), and energy (2.85). Consistent with analysts providing less effort and committing fewer resources toward companies that will likely generate less trading revenue for the brokerage firm (Hayes 1998; Irvine 2000), it appears that more regulated, slower growth industries have more rounded forecasts.

---

[19] The decrease in analyst rounding over time is consistent with the temporal improvement in forecast accuracy (Brown 1997, 2001b; Lopez and Rees 2002; Matsumoto 2002).

Herding of Analyst Forecasts

We examine the relation between rounding and herding of analyst forecasts by testing whether rounded forecast revisions move the analyst's estimate toward (i.e., herding) or away from the consensus. Gleason and Lee (2003) and Clement and Tse (2003, 2004) define revisions that move away from the consensus as bold (or high innovation) forecasts and those that move toward the consensus as herding (or low innovation) forecasts. If rounded forecasts come from less informed analysts, then rounded forecast revisions should be more likely to move toward the consensus. Focusing on the final forecast revision, we find that rounders herd 71.05 percent of the time while non-rounders herd 67.07 percent of the time.[21] The difference in herding between rounders and non-rounders is significant (p-value < 0.01), suggesting that rounders are more likely to provide low innovation (i.e., herding) forecasts.

V. CONCLUSION

Analyst forecasts of earnings per share occur at nickel intervals far more often than expected based either on random occurrence or actual reported earnings per share. Research in fields outside of accounting and finance, known as "heaping," documents that subject responses or observer assessments occurring at common numeric intervals generally contain greater measurement error. Applying this literature to analyst forecasts, rounded forecasts should exhibit characteristics of less informed analysts and be less accurate (i.e., have greater measurement error). The inability or unwillingness of rounding analysts to fully and objectively gather and process information implies that forecast dispersion decreases with exclusion of rounded forecasts.

The results are consistent with our expectations. Rounded forecasts are associated with forecast characteristics of less informed analysts. Rounding analysts have lower prior accuracy, come from smaller brokerage firms, forecast less frequently, have longer forecast horizons, and follow more firms and industries. Rounded forecasts are less accurate. Rounding does not simply proxy for other analyst forecast characteristics related to forecast accuracy in prior research, but is an incrementally significant variable in explaining forecast accuracy. We also find that capital market expectations are more highly correlated with the consensus forecast that includes rounding analysts, suggesting that market participants do not fully incorporate characteristics of analysts that round. Finally, excluding rounded forecasts reduces forecast dispersion even after controlling for differences in forecast horizon.

Consensus earnings forecasts represent a key input to the investment community in setting market expectations. Yet, not all earnings forecasts included in the consensus are of equal quality. Consensus earnings forecasts are a combination of forecasts from both the most and the least informed analysts. We provide evidence that rounded forecasts are more likely to be among the latter group. Investors should consider reducing the importance they place on analyst forecasts reported at common intervals.

---

[20] The extent of rounded reported earnings per share is relatively constant across industries.

[21] The sample size is 58,137 for rounders and 52,322 for non-rounders. The decrease in sample size is due to eliminating observations in which the analyst provides only one forecast for the firm in that year (i.e., no forecast revision is made).

An interesting issue for future research is why do analysts issue rounded forecasts, possibly signaling their lack of specialized knowledge, when rounded forecasts could be disguised. It may be that analysts are not aware that they are signaling by issuing rounded forecasts. We know of no prior research that has studied the forecast properties of rounding analysts. The decision to round likely relates to the cost-benefit structure facing analysts. When the benefits to accurately forecasting earnings are high enough, analysts will incur the costs of gathering additional information, leading to more precise forecasts. When the benefits are low, rounded forecasts may be cost efficient. Future research may wish to examine these cost-benefit trade-offs and their relationship to the informativeness of analysts.

REFERENCES

Abarbanell, J. 1991. Do analysts' earnings forecasts incorporate information in prior stock price changes? *Journal of Accounting and Economics* 14 (June): 147–165.

———, and V. Bernard. 1992. Tests of analysts' overreaction/underreaction to earnings information as an explanation for anomalous stock price behavior. *Journal of Finance* 47 (July): 1181–1207.

Ackert, L., and G. Athanassakos. 1997. Prior uncertainty, analyst bias, and subsequent abnormal returns. *Journal of Financial Research* 20 (Summer): 263–273.

Ali, A., A. Klein, and J. Rosenfeld. 1992. Analysts' use of information about permanent and transitory earnings components in forecasting annual EPS. *The Accounting Review* 67 (January): 183–198.

Baber, W., and S. Kang. 2002. The impact of split adjusting and rounding on analysts' forecast error calculations. *Accounting Horizons* 16 (December): 277–289.

Barron, O., O. Kim, S. Lim, and D. Stevens. 1998. Using analysts' forecasts to measure properties of analysts' information environment. *The Accounting Review* 73 (October): 421–433.

Bartov, E., D. Givoly, and C. Hayn. 2002. The rewards to meeting or beating earnings expectations. *Journal of Accounting and Economics* 33 (June): 173–204.

Benford, F. 1938. The law of anomalous numbers. *Proceedings of the American Philosophical Society* 78 (March): 551–572.

Brown, L. D., P. A. Griffin, R. L. Hagerman, and M. E. Zmijewski. 1987a. Security analyst superiority relative to univariate time-series models in forecasting quarterly earnings. *Journal of Accounting and Economics* 9 (April): 61–87.

———, ———, ———, and ———. 1987b. An evaluation of alternative proxies for the market's assessment of unexpected earnings. *Journal of Accounting and Economics* 9 (July) 159–193.

———, and K. J. Kim. 1991. Timely aggregate analyst forecasts as better proxies for market earnings expectations. *Journal of Accounting Research* 29 (Autumn): 382–385.

———. 1993. Earnings forecasting research: Its implications for capital markets research. *International Journal of Forecasting* 9 (November): 295–320.

———. 1997. Analysts' forecast errors: Additional evidence. *Financial Analysts Journal* 53 (November/December): 81–88.

———, E. S. Burgess, S. D. Sales, J. A. Whiteley, D. M. Evans, and I. W. Miller. 1998. Reliability and validity of a smoking timeline follow-back interview. *Psychology of Addictive Behaviors* 12 (June): 101–112.

———. 2001a. How important is past analyst forecast accuracy? *Financial Analysts Journal* 57 (November/December): 44–49.

———. 2001b. A temporal analysis of earnings surprises: Profits versus losses. *Journal of Accounting Research* 39 (September): 221–241.

———, and E. Mohd. 2003. Profiting from predicting individual analyst earnings forecast accuracy. *Journal of Accounting, Auditing & Finance* 18 (Fall): 625–648.

———, and M. Caylor. 2005. A temporal analysis of quarterly earnings thresholds: Propensities and valuation consequences. *The Accounting Review* (forthcoming).

Clement, M. B. 1999. Analyst forecast accuracy: Do ability, resources, and portfolio complexity matter? *Journal of Accounting and Economics* 27 (June): 285–303.

———, L. Rees, and E. P. Swanson. 2003. The influence of culture and corporate governance on the characteristics that distinguish superior analysts. *Journal of Accounting, Auditing & Finance* 18 (Fall): 593–618.

———, and S. Y. Tse. 2003. Do investors respond to analysts' forecast revisions as if forecast accuracy is all that matters? *The Accounting Review* 78 (January): 227–249.

———, and ———. 2004. Financial analyst characteristics and herding behavior in forecasting. *Journal of Finance* 60 (February): 307–341.

Das, S., and H. Zhang. 2003. Rounding-up in reported EPS, behavioral thresholds, and earnings management. *Journal of Accounting and Economics* 35 (April): 31–50.

Diether, K., C. Malloy, and A. Scherbina. 2002. Differences of opinion and the cross section of stock returns. *Journal of Finance* 57 (October): 2113–2141.

Easterwood, J., and S. R. Nutt. 1999. Inefficiency in analysts' earnings forecasts: Systematic misreaction or systematic optimism? *Journal of Finance* 54 (October): 1777–1797.

Elliott, J., D. Philbrick, and C. Wiedman. 1995. Evidence from archival data on the relation between security analysts' forecasts errors and prior forecast revisions. *Contemporary Accounting Research* 11 (Summer): 919–938.

Fried, D., and D. Givoly. 1982. Financial analysts' forecasts of earnings: A better surrogate for market expectations. *Journal of Accounting and Economics* 4 (October): 85–107.

Gleason, C., and C. Lee. 2003. Analyst forecast revisions and market price discovery. *The Accounting Review* 78 (January): 193–225.

Hayes, R. 1998. The impact of trading commission incentives on analysts' stock coverage decisions and earnings forecasts. *Journal of Accounting Research* 36 (Autumn): 299–320.

Heitjan, D. 1994. Ignorability in general incomplete data models. *Biometrika* 81 (August): 701–708.

Hobson, R. 1976. Properties preserved by some smoothing functions. *Journal of the American Statistical Association* 71 (September): 763–766.

Hong, H., and J. Kubik. 2003. Analyzing the analysts: Career concerns and biased earnings forecasts. *Journal of Finance* 58 (February): 313–351.

Hope, O-K. 2003. Accounting policy disclosures and analysts' forecasts. *Contemporary Accounting Research* 20 (Summer): 295–321.

Huttenlocher, J., L. V. Hedges, and N. M. Bradburn. 1990. Reports of elapsed time: Bounding and rounding processes in estimation. *Journal of Experimental Psychology* 16 (March): 196–213.

Imhoff, E., and G. Lobo. 1992. The effect of *ex ante* earnings uncertainty on earnings response coefficients. *The Accounting Review* 67 (April): 427–439.

Irvine, P. 2000. Do analysts generate trade for their firms? Evidence from the Toronto stock exchange. *Journal of Accounting and Economics* 30 (October): 209–226.

Jacob, J., T. Lys, and M. Neale. 1999. Expertise in forecasting performance of security analysts. *Journal of Accounting and Economics* 28 (November): 27–50.

Kinney, W., D. Burgstahler, and R. Martin. 2002. Earnings surprise materiality as measured by stock returns. *Journal of Accounting Research* 40 (December): 1297–1392.

Lopez, T., and L. Rees. 2002. The effect of beating and missing analysts' forecasts on the information content of unexpected earnings. *Journal of Accounting, Auditing & Finance* 17 (Spring): 155–184.

Matsumoto, D. A. 2002. Management's incentives to avoid negative earnings surprises. *The Accounting Review* 77 (July): 483–514.

McCarty, C., P. Killworth, H. Bernard, E. Johnson, and G. Shelley. 2001. Comparing two methods for estimating network size. *Human Organization* 60 (Spring): 28–39.

Mendenhall, R. 1991. Evidence on the possible under-weighting of earnings related information. *Journal of Accounting Research* 29 (Spring): 170–179.

Mikhail, M., B. Walther, and R. Willis. 1997. Do security analysts improve their performance with experience? *Journal of Accounting Research* 35 (Supplement): 131–166.

———, ———, and ———. 1999. Does forecast accuracy matter to securities analysts? *The Accounting Review* 74 (April): 185–200.

———, ———, and ———. 2003. The effect of experience on security analyst underreaction. *Journal of Accounting and Economics* 35 (April): 101–116.

O'Brien, P. 1988. Analysts' forecasts as earnings expectations. *Journal of Accounting and Economics* 10 (January): 53–83.

———. 1990. Forecast accuracy of individual analysts in nine industries. *Journal of Accounting Research* 28 (Autumn): 286–304.

Payne, J., and S. Robb. 2000. Earnings management: The effect of ex ante earnings uncertainty. *Journal of Accounting, Auditing & Finance* 15 (Fall): 371–392.

———, and W. B. Thomas. 2003. The implications of using stock split adjusted I/B/E/S data in empirical research. *The Accounting Review* 78 (October): 1049–1067.

———, and ———. 2005. The effect of earnings thresholds on stock returns. Working paper, University of Oklahoma.

Ramnath, S. 2002. Investor and analyst reactions to earnings announcements of related firms: An empirical analysis. *Journal of Accounting Research* 40 (December): 1351–1376.

Roberts, J., and D. Brewer. 2001. Measures and tests of heaping in discrete quantitative distributions. *Journal of Applied Statistics* 28 (September): 887–896.

Rowland, M. L. 1990. Self-reported weight and height. *American Journal of Clinical Nutrition* 52 (December): 1125–1133.

Schipper, K. 1991. Analysts' forecasts. *Accounting Horizons* 5 (December): 105–121.

Singh, K., C. M. Suchindran, and R. S. Singh. 1994. Smoothed breastfeeding durations and waiting time to conception. *Social Biology* 41 (Fall-Winter): 229–239.

Sinha, P., L. D. Brown, and S. Das. 1997. A re-examination of financial analysts' differential earnings forecast accuracy. *Contemporary Accounting Research* 14 (Spring): 1–42.

Thomas, J. 1989. Unusual patterns in reported earnings. *The Accounting Review* 64 (October): 773–787.

Torelli, N., and U. Trivellato. 1993. Modeling inaccuracies in job-search duration data. *Journal of Econometrics* 59 (January/February): 187–211.

Ureta, M. 1992. The importance of lifetime jobs in the U.S. economy, revisited. *American Economic Review* 82 (March): 322–335.

Wen, S. W., M. S. Kramer, J. Hoey, J. A. Hanley, and R. H. Usher. 1993. Terminal digit preference, random error, and bias in routine clinical measurement of blood pressure. *Journal of Clinical Epidemiology* 46 (October): 1187–1193.

Wright, D. E., and I. Bray. 2003. A mixture model for rounded data. *Journal of the Royal Statistical Society* 52 (April): 3–13.

Ziebart, D. 1990. Evidence regarding divergence of analysts' forecasts of annual earnings per share: Does consensus increase as the forecast horizon declines? *Proceedings of the 1990 Midwest Regional Meeting of the American Accounting Association*, 177–185. Sarasota, FL: AAA.

THE ACCOUNTING REVIEW
Vol. 80, No. 3
2005
pp. 825–846

Strategic Disclosure of Risky Prospects: A Laboratory Experiment

Jessen L. Hobson
The University of Texas at Austin

Steven J. Kachelmeier
The University of Texas at Austin

ABSTRACT: In a market experiment, buyers respond to sellers' disclosures of one of the two potential outcomes of a risky prospect. Buyer reactions reflect two separate disclosure phenomena that heretofore have not been considered jointly. First, consistent with cognitive predictions that users tend to anchor on explicit one-sided disclosures, buyers pay more relative to expected value when the seller discloses the higher of the two potential outcomes than when the seller discloses the lower potential outcome. Second, consistent with the incentive-driven predictions of information economics, buyers systematically discount bids when sellers *choose* which potential outcome they wish to disclose, relative to bids in a control condition in which the seller is constrained to disclose randomly. Both findings are robust to each other, addressing qualifications in prior research about generalizing cognitive disclosure phenomena to a strategic disclosure environment. One implication supported by the data is that if cognitive information processing limitations are robust to a strategic environment, then strategic agents can exploit these limitations when choosing disclosures.

Keywords: *risk; one-sided disclosure; anchoring; information economics.*

Data Availability: *The experimental data are available for purposes of replication. Please contact the authors.*

We appreciate helpful comments on previous drafts from two anonymous reviewers and Jake Birnberg, Bryan Church, Shawn Davis, John Dickhaut, Nick Dopuch, Harry Evans, Jeffrey Hales, Rick Hatfield, Eric Hirst, Leslie Hodder, Pat Hopkins, Skip Hughes, Steve Kaplan, Ron King, Lisa Koonce, Tim Louwers, Jordan Lowe, Laureen Maines, Don Moser, Austin Reitenga, Kenny Reynolds, Casey Rowe, Jerry Salamon, Geoff Sprinkle, Kristy Towry, and workshop participants at Arizona State University, Georgia Institute of Technology, Indiana University, Louisiana State University, Oklahoma State University, University of Pittsburgh, The University of Texas at Austin, The University of Texas at San Antonio, and Washington University in St. Louis. We are grateful for research support provided by The University of Texas at Austin Center for Business Measurement and Assurance Services, the McCombs School of Business Behavioral Research Laboratory, and the Eugene and Dora Bonham Memorial Fund. Professor Kachelmeier also gratefully acknowledges the support of the Charles T. Zlatkovich Centennial Professorship in Accounting at The University of Texas at Austin.

Editor's note: This paper was accepted by Terry Shevlin, Senior Editor.

Submitted March 2003
Accepted October 2004

I. INTRODUCTION

We examine user reactions to disclosures of part but not all of the possible outcomes of a risky prospect. Dietrich et al. (2001) refer to such disclosures as "one-sided" in nature, because they emphasize a prospect's upside or downside potential, but not both. We extend prior research on one-sided disclosures by manipulating whether the disclosing agent is constrained to disclose randomly (i.e., exogenous disclosure) or is allowed to choose disclosures strategically with known incentives for higher user valuations of the prospect (i.e., endogenous disclosure).

Our interest in strategic one-sided disclosures of risk is motivated by a broader interest in integrating the different theoretical perspectives of cognitive psychology and information economics regarding user reactions to disclosures. The psychological perspective emphasizes users' excessive reliance on explicit disclosures. Several accounting experiments support this premise by manipulating disclosure alternatives as an exogenous treatment variable (Libby et al. 2002). With respect to our interest in one-sided disclosures of risk, examples include experimental demonstrations of the biasing effects of one-sided information about contingent environmental liabilities (Kennedy et al. 1998), derivative financial instruments (Koonce et al. 2005), and asset reserves in the extractive industries (Dietrich et al. 2001). The theme common to these studies is that users overemphasize explicitly disclosed information, underweighting known aspects in which the disclosed information is incomplete.

In contrast, information economics views the disclosure question from a more strategic perspective. As explained by Dye (2001, 185), "one has to anticipate both the incentives of those who made the comments and the set of alternative comments they could have made but chose not to." Contingent on assumptions regarding information asymmetry, disclosure costs, and the set of allowed disclosures, the literature that draws from this perspective examines users' ability to anticipate management's incentive to "disclose information that is favorable to the entity and not disclose information unfavorable to the entity" (Dye 2001, 184).

Just as there are several accounting experiments that test cognitive information processing theories, several accounting experiments test economic models of strategic disclosure. To focus on disclosure incentives, these studies examine settings in which profit-motivated, compensated participants (analogous to managers) *choose* disclosures and other participants (analogous to investors) draw inferences about these choices. Examples include studies of discretionary disclosure with differing degrees of information asymmetry (King and Wallin 1991a; Dickhaut et al. 2003), different sets of allowed disclosures (King and Wallin 1991b), proprietary costs (King and Wallin 1995), abilities to shift information between public and private signals (Bloomfield 1996), and information timing issues (King and Wallin 1996). The theme common to these studies is that managers tend to choose disclosures strategically to maximize value. Further, investors are mostly cognizant of these incentives, discounting values in cases of partial (or no) disclosure to adjust for management's information advantage.

Studies of cognitive theories of information processing and studies of the strategic incentive aspects of disclosure exhibit little overlap (Kachelmeier and King 2002), although experiments with manipulated (i.e., exogenous) disclosures frequently acknowledge limitations in generalizing results to a strategic world with endogenous disclosures (e.g., Bloomfield and Libby 1996; Hopkins 1996; Kennedy et al. 1998; Bloomfield and Wilks 2000; Hopkins et al. 2000; Dietrich et al. 2001). Such qualifications probably arise because the cognitive perspective emphasizes the explicit over the implied, whereas information economics emphasizes implied strategic inferences over explicit disclosures, per se. The incremental contribution of the current study is to address the compatibility of cognitive and strategic disclosure phenomena as an empirical question, jointly examining theory-driven predictions from both perspectives.

This contribution is important as a "bridge-building" effort to further the integration of psychological and economic theories in accounting (Kachelmeier 1996; Moser 1998; Kachelmeier and King 2002). It is also important from a policy standpoint, because regulatory disclosure policies generally have both cognitive and strategic implications. For example, policy-motivated studies by Hirst and Hopkins (1998) and Maines and McDaniel (2000) draw from the cognitive limitations of human information processing to predict (and find) that users form better judgments when comprehensive income is disclosed as an explicit performance statement than when it is buried as a reconciliation within the Statement of Shareholders' Equity. Adding a strategic perspective to this issue would question why management would favor one alternative over the other, as certainly appears to be the case in practice (the vast majority of companies opt for the reconciliation alternative). The extent to which the cognitive limitations identified in these studies extend to a strategic disclosure environment can help to explain the disclosure choices made by companies, in turn suggesting a more sophisticated perspective for accounting regulators that takes both "user-friendliness" and strategic incentives into account. While our study does not examine comprehensive income, it does examine the robustness of cognitive information processing biases to a strategic environment.

In our experiment, a seller (manager) presents three potential buyers (investors) with a risky prospect that is known to liquidate either as a high value or as a low value, with both possibilities equally probable. The seller is required to disclose the exact amount of one of the two potential outcomes, but not both. We find that buyers' bids, standardized for expected value, are higher when the seller discloses the high possibility than when the seller discloses the low possibility. This finding is consistent with the cognitive premise that individuals tend to anchor on information that is disclosed explicitly, even when that information is known to be incomplete. We also find that standardized bids are lower when a seller with private knowledge of both possibilities is allowed to choose which possibility to disclose, relative to bids in a control condition in which a nonstrategic seller's disclosures are determined by a random (50-50) process. This finding is consistent with the information economics premise that buyers in a strategic environment take the seller's information advantage into account.

Most importantly, we find that the two phenomena summarized above are robust to each other, with no interaction between the separate effects of disclosure *form* (high or low) and disclosure *source* (strategic or nonstrategic). That is, buyers willingly pay a premium when the seller discloses the high possibility, irrespective of whether the seller's disclosures are strategic or nonstrategic. Buyers also systematically discount values inferred from strategically chosen disclosures, irrespective of whether the seller discloses the high possibility or the low possibility. Together, these findings suggest that users' reactions to disclosures can simultaneously reflect both cognitive information-processing limitations and strategic inferences. One implication supported by the data is that sellers can exploit buyers' cognitive limitations by sometimes disclosing the high potential outcome even when a low-outcome disclosure would imply a larger expected value of the risky prospect under consideration.

Section II explains our experimental setting in greater detail, followed by the cognitive and strategic predictions we hypothesize. Section III describes our experimental procedures. Section IV presents results, and Section V concludes.

II. SETTING, THEORY, AND HYPOTHESES

Setting

We begin by describing the setting characterizing our experiment in order to facilitate discussion of the theories we test and hypotheses we predict. A single seller presents three potential buyers with a risky prospect that can result in one of two equally probable outcomes: high or low. As explained in Section III, we examine this basic structure for both gain prospects that buyers bid to obtain and loss prospects that buyers bid to avoid, in order to generalize findings and control for risk preferences. For now, the more important point is that whether the prospect is a risky gain or a risky loss, the seller strictly prefers higher user valuations of the prospect, because higher valuations map into higher competitive bids.

It is common knowledge among the seller and buyers that, *ex ante*, the high potential outcome is distributed uniformly between $5.00 and $10.00 and, independently, the low potential outcome is distributed uniformly between $0 and $5.00. Thus, the *ex ante* expected value of the prospect is $5.00 (i.e., .5[$5.00 + $10.00]/2 + .5[$0 + $5.00]/2). The seller is known to have private knowledge of the exact amounts of both the high and low potential outcomes, but not which of these two potential outcomes has obtained. By fiat, an antifraud rule requires the seller to disclose truthfully (and costlessly) the exact amount of *one* of the two potential outcomes before buyers submit their bids. It is common knowledge whether the seller's disclosure of the high or low potential outcome is determined by a random process (i.e., nonstrategic disclosure) or whether the seller can choose (i.e., strategic disclosure, although we do not use the word "strategic" in the experimental materials).

Although disclosure is costless and the seller is known to have private knowledge of both possibilities, the restriction that the seller can disclose only one possibility precludes the "full disclosure" prediction of information economics (e.g., Grossman 1981; Milgrom 1981). One can interpret our setting as being analogous to cases in which a regulator requires firms to choose one of two reporting options, but not both. Alternatively, one can interpret the setting as implying costly *verification* that prevents credible disclosure of both potential outcomes. Setting aside these two interpretations, as a practical matter, the full-disclosure result does not always obtain even in cases in which it should (King and Wallin 1991a, 1996), justifying our interest in partial disclosure.[1] As explained next, the restriction to partial disclosure allows us to incorporate cognitive views of how people process one-sided information.

The Cognitive Perspective: Evaluating One-Sided Disclosures

A recurring theme in Payne et al.'s (1993, Chap. 2) review of psychological research on human information processing is that when processing partial information, decision makers tend to simplify the task by using explicit cues as a reference point. That is, instead of integrating explicit and implicit information in a holistic manner, individuals tend to start with the explicit and adjust for the implicit. Although such adjustments are typically in the right direction, they are usually insufficient in magnitude, such that final judgments are typically biased toward one-sided explicit disclosures (Brenner et al. 1996; Hirshleifer and Teoh 2003, 346–347).

---

[1] King and Wallin (1991a) and especially King and Wallin (1996) found a nontrivial degree of withheld disclosure even in environments in which managers were known with certainty to possess private information and could disclose that information costlessly. By contrast, King and Wallin (1990) supported the full-disclosure prediction when an antifraud rule was in place. One possible reason for the different results is that realizations were constrained to only three possible values in King and Wallin's 1990 experiment, as opposed to eight in their 1991a experiment and a uniform distribution from 5 to 95 cents in their 1996 experiment.

This process can be interpreted within the framework of the familiar "anchoring and adjustment" heuristic (Tversky and Kahneman 1974; Epley and Gilovich 2004), except that unlike the irrelevant anchors that are often manipulated in anchoring studies, one-sided information is *relevant to the decision*, albeit biased in one direction. Epley and Gilovich (2004) find that relevant, meaningful anchors are *more* likely to result in insufficient adjustment. Hence, an anchoring and adjustment process is likely to characterize a setting such as ours, in which one potential outcome of a risky prospect is disclosed explicitly and the other side has to be inferred from its underlying distribution.

More specifically, a disclosed high (low) potential outcome in our setting provides an explicit anchor point that by construction always exceeds (is less than) the prospect's expected value. Accordingly, buyers who reason in the manner described above would form bid prices by adjusting downward (upward) from a high (low) disclosed potential outcome. *Controlling for expected value*, if such adjustments are *insufficient*, they will not arrive at the same point (Brenner et al. 1996). Rather, the downward adjustment from a high-outcome disclosure is likely to yield a higher bid price than would an upward adjustment from a low-outcome disclosure.

It is important to clarify that this reasoning process can still reflect the information content of the disclosure. For example, disclosing a $5.10 high potential outcome indicates a very low draw within the known high distribution from $5.00 to $10.00, and hence should result in much lower buyer valuations than, say, a disclosure that the low potential outcome is $4.90 (which is near the top of the $0 to $5.00 low range). Nevertheless, the anchoring process set forth above suggests that when buyers adjust downward from a disclosed high potential outcome, they will arrive at higher bid prices than those resulting from a low-outcome disclosure *that implies the same expected value*. Thus, for example, high-outcome disclosures of $9.90, $7.50, or $5.10 should result in higher bids than the expected-value equivalent low-outcome disclosures of $4.90, $2.50, or $0.10, respectively. Hypothesis 1 formalizes the prediction:

H1: Controlling for expected value, buyers will submit higher bids when the seller discloses the high potential outcome than when the seller discloses the low outcome.

In the accounting literature, we are aware of three studies that test hypotheses similar to H1. First, Kennedy et al. (1998) report that professionally experienced participants would pay more to settle a contingent environmental liability when provided with a disclosure of the maximum potential liability than when provided with the minimum. A second example is a questionnaire-based study by Koonce et al. (2005) that examines one-sided disclosures of risk associated with derivative financial instruments. Third, Dietrich et al. (2001) take a different approach to the question, conducting compensated laboratory markets to investigate price reactions to exogenous one-sided risk disclosures patterned after reserve disclosures in the extractive industries. All three studies report findings roughly consistent with H1.

It is interesting to compare these experiments, as they employ different approaches but generate similar findings. Kennedy et al. (1998) and Koonce et al. (2005) focus on losses, using questionnaire approaches to elicit individual judgments from participants who did not earn performance-based compensation. Dietrich et al. (2001) examine laboratory market prices for risky gain prospects traded by participants with compensated profit motives. The similar findings of these studies despite their different approaches suggest that the biasing effects of one-sided risk disclosures are robust. However, in all of these studies, the disclosure alternatives are manipulated by the researchers rather than chosen by the participants. What would happen if a strategic agent could *choose* the desired disclosure? It is to this question that we now turn.

The Economic Perspective: Strategic Disclosure

Suppose that a seller with private knowledge of the potential high and low outcomes of a risky prospect can choose which potential outcome to disclose (credibly) and which to keep private. If the seller reasons that buyers will pay more for prospects of greater expected value, then an optimal strategy is to disclose the potential outcome that maximizes implied expected value:

$$\max(.5H + .5[\$0 + \$5.00]/2,\ .5[\$5.00 + \$10.00]/2 + .5L)$$

where H represents a disclosed high possibility and L represents a disclosed low possibility. Equivalently, given our parameters, the seller who wishes to maximize implied expected value should disclose whichever potential outcome (H or L) is higher *relative to its own independent distribution.* Thus, for example, a $3.50 potential low outcome is "better news" for the seller than a $7.50 potential high outcome, because the former value is $1.00 above the midpoint of its $0 to $5.00 uniform distribution, implying a higher expected value of the prospect than would the $7.50 high possibility that is at the midpoint of its $5.00 to $10.00 distribution.

In equilibrium, rational buyers should be aware of the strategic seller's incentives and disclosure strategy outlined above. Thus, in valuing the prospect, buyers should adjust for this strategy by truncating the distribution of the nondisclosed potential outcome at an amount that would imply the same expected value as the disclosed potential outcome. Intuitively, buyers should reason that the potential outcome the seller chose *not* to disclose could not possibly imply an even higher expected value, because otherwise the seller would have disclosed it instead.[2] Formally, given our parameters, the adjusted expected value taking the seller's information advantage into account is $.5H + .5[S0 + (H - \$5.00)]/2$ for a disclosed high possibility, and $.5[\$5.00 + (\$5.00 + L)]/2 + .5L$ for a disclosed low possibility. These truncated computations are strictly lower than those that do not take the seller's disclosure strategy into account.

We refer to the lower expected values inferred by rational buyers in equilibrium as "strategic discounting." This discounting does not change the seller's disclosure strategy, as the potential outcome (H or L) that maximizes the prospect's implied expected value before discounting continues to maximize the implied expected value after discounting. Moreover, the seller is not "penalized" by strategic discounting, as this discounting simply offsets the seller's expected advantage in disclosing more favorable potential outcomes and censoring less favorable outcomes. Thus, given our parameters and assumptions, a strategic seller who is allowed to choose disclosures should be no better off or worse off in an information economics sense than a nonstrategic seller who does not have this discretion.

---

[2] A nonaccounting example of similar intuition is the July 2003 release of *The League of Extraordinary Gentlemen* by Twentieth Century Fox. The national advertisement for this movie quoted a positive comment from a reviewer at a local ABC affiliate in Tucson. From an information economics perspective, a rational moviegoer would interpret this advertisement as an unfavorable disclosure, reasoning that more well-known, national critics probably disliked the movie (as was indeed the case), because otherwise their comments would have been disclosed instead. Dye (2001, 184–185) offers several other examples from everyday life.

Nevertheless, relative to "naive" expected values that ignore strategic discounting, information economics would predict lower standardized bids in a strategic disclosure setting than in a nonstrategic setting in which the seller cannot exercise an information advantage:

> **H2:** Relative to "naive" expected values that reflect the disclosed outcomes but ignore strategic incentives, buyers will submit lower bids when the seller chooses which potential outcome to disclose than when a random device determines the disclosure.

There are numerous experiments in the accounting literature that evidence various forms of strategic discounting in other settings. Several of these test the "full disclosure" prediction of Grossman (1981) and Milgrom (1981), along with institutional restrictions that modify this prediction. A prime example involves uncertainty regarding whether (King and Wallin 1991a), when (King and Wallin 1996), or the extent to which (Dickhaut et al. 2003) the manager obtains private information, following the models of Dye (1985), Jung and Kwon (1988), and Shin (1994). A second example involves proprietary costs that occur if disclosing particularly high values attracts competitors as well as investors (King and Wallin 1995). Still other experiments relax the assumption of truthful reporting in some cells, testing the incremental effects of feedback (King and Wallin 1990), reputations (King 1996), or strategic allocations between public and private signals (Bloomfield 1996).

While our H2 is consistent with the same broad theme of wealth-maximizing disclosure strategies and rational inferences as these other studies, an important difference is that instead of choosing *whether* to disclose, the seller in our setting decides *which* disclosure to issue of the two available alternatives (high or low). In this sense, our study is closer to an experiment by King and Wallin (1991b), which provided sellers with complete information, a variety of disclosure options, and a requirement in two cells to disclose *something*. Our experiment differs from King and Wallin (1991b) insofar as we consider risky prospects that can take on one of two possible outcomes after disclosure, whereas they consider assets with a single liquidating dividend that is known by the seller. Nevertheless, one finding from King and Wallin (1991b) is particularly germane to our experiment. Namely, King and Wallin (1991b) find that investors are less able to unravel sellers' disclosure strategies when there are several disclosure options and when buyers are unaware of the set of allowable disclosures. Accordingly, to give H2 its "best shot" in a context with multiple potential outcomes and the possibility of simultaneous cognitive biases (H1), we limit the disclosure alternatives to two (high or low), with full explanation to both the seller and the potential buyers.

Can H1 and H2 Coincide?

Although H1 and H2 represent different theoretical perspectives, they are not necessarily contradictory. That is, it is possible that buyers could pay more when the seller discloses the high potential outcome (consistent with H1), irrespective of whether the seller is strategic or nonstrategic, while also systematically discounting strategic disclosures (consistent with H2), irrespective of whether the seller discloses the high or the low potential outcome.

Of course, it is also possible that a strategic disclosure environment could limit any cognitive effects from exogenous disclosures. The literature certainly seems skeptical. Kennedy et al. (1998, §5.3), for example, acknowledge limited ability to distinguish anchoring (their preferred interpretation) from strategic signaling as the force driving their results, given the references to a hypothetical "management" in their experimental materials. To address this ambiguity, the authors report a supplemental experiment in which they replace references to management with references to an independent engineering consultant, finding the same biasing effects of one-sided disclosures. However, even Kennedy et al.'s (1998) supplemental experiment leaves some questions unanswered, given that there were no literal disclosure choices by participants in any of their experimental cells.

Similarly, although Dietrich et al. (2001) conduct a laboratory market experiment that examines negotiated prices instead of hypothetical judgments, their disclosure alternatives are again manipulated by the experimenters rather than chosen by the participants, prompting the authors to acknowledge their inability to "generalize to strategic settings where disclosures are endogenously determined" (Dietrich et al. 2001, 266). Qualifications of this nature also appear in Bloomfield and Libby (1996), Hopkins (1996), Bloomfield and Wilks (2000), and Hopkins et al. (2000). At a broader level, even Payne et al. (1993, 256–257) acknowledge the need to extend research on the cognition of human information processing to the social context of "competitive decisions ... [in which] others may be trying to maximize their outcomes at our expense."

In our setting, it is possible that strategic disclosures could prompt buyers to be more leery of any cognitive tendency to anchor on explicit disclosures. Conversely, Arkes (1991) classifies anchoring as a "psychophysical" (loosely, "hardwired") bias, suggesting that it is unlikely to be moderated by strategic incentives. In the end, the debate boils down to an empirical question that our study attempts to address. Because there are tenable arguments on both sides, we express the interaction hypothesis implied by these arguments in the null form:

H3: The effects on bids of high versus low explicit disclosure (H1) and strategic discounting (H2) will not interact.

Implications for Strategic Sellers

Our hypotheses to this point have focused on buyers' reactions to sellers' disclosures. To examine seller behavior as well, our final hypothesis considers implications of H3 that strategic sellers could exploit. We use the word "exploit" guardedly, because in an information economics sense, sellers cannot "exploit" their information advantage if buyers anticipate that advantage. But if H3 holds and buyers pay a premium for high-outcome disclosures even in a strategic disclosure environment, sellers can exploit that tendency by sometimes disclosing the high potential outcome even when the low potential outcome would imply a greater expected value of the prospect. To examine this reasoning, we test H4 below:

H4: To the extent that strategic sellers do not disclose the potential outcome that maximizes the implied expected value of the prospect, they will tend to favor disclosing the high potential outcome.

III. EXPERIMENTAL METHOD

We recruited students from master's-level accounting classes at The University of Texas at Austin for a compensated market experiment. Each of 12 two-hour sessions operationalized the setting described in Section II with one seller and three buyers, assigned randomly. Figure 1 summarizes the experimental sequence. In six of the sessions (strategic disclosure), all parties were aware that the seller could choose the desired disclosure after drawing potential outcome values from both a "high" deck of customized cards (ranging

FIGURE 1
Experimental Sequence for Each Trial

Step 1: Seller privately draws cards from two customized decks to determine high and low potential outcomes.
Step 2: Seller indicates to the experimenter which potential outcome s/he wishes to disclose (strategic condition) or draws a chip that determines the disclosure randomly (nonstrategic condition).
Step 3: Experimenter reveals the disclosed card to three potential buyers.
Step 4: Buyers enter bids on private bid sheets, as observed by the experimenter.
Step 5: In feedback rounds only, experimenter reveals all three bids and both potential outcomes.
Step 6: Experimenter replaces all materials and shuffles both the high and low potential outcome decks before proceeding to the next trial.

between \$5.00 and \$10.00 in ten-cent increments) and a "low" deck (ranging between \$0 and \$5.00). In the other six sessions (nonstrategic disclosure), the seller (blindly) drew either a red or blue chip each trial that determined which potential outcome was disclosed.[3] A post-experimental questionnaire confirmed that all participants understood whether the seller could choose the disclosures. In both conditions, the seller did not *literally* disclose the potential outcome. Instead, the experimenter physically revealed the card chosen by the seller or determined by the random draw, depending on the condition.[4] This process ensured buyers of the disclosure's credibility and also precluded any extraneous communication from the seller.[5] The experiment did not involve deception of any form.

After the seller's disclosure, buyers entered bids on "bid sheets" that were observed by the experimenter. The instructions specified that the risky gain prospect (or avoidance of the risky loss prospect, see below) would be awarded to the highest bidder in exchange for his/her bid price, which went to the seller. Thus, we employ a first-price, sealed-bid auction, similar to King and Wallin (1990, 1991a), King (1996), and Dickhaut et al. (2003). Relative to a variety of alternatives,[6] a first-price auction has the advantage of simplicity (see Dickhaut et al. 2003, 32), which we felt was important given the nuances of our setting. We later report similar results using median bids to confirm that our findings are not limited to the highest valuing bidder.

Trials and Rounds

We repeated the process described above 40 times in each session, with each iteration labeled a "trial." In an attempt to generalize results, we organized these 40 trials into four "rounds" of ten trials each. Within sessions, the four rounds varied between (1) gain and loss prospects, and (2) no feedback versus feedback. We explain each manipulation below.

---

[3] One might question the use of a human seller in the nonstrategic disclosure condition, given that such sellers did not make any decisions, but simply followed instructions regarding the random determinations of potential outcomes and disclosures. We used a human seller even in the nonstrategic condition to hold constant any other considerations involving buyer-seller interaction, such as concerns for fairness (Luft 1997).

[4] The only potential outcome common to both decks was \$5.00. In the (rare) event that a seller disclosed a \$5.00 potential outcome, the experimenter informed buyers whether it came from the high deck or the low deck.

[5] Although the experiment was administered manually, there was no verbal communication by the participants, as all decisions were written discreetly in a well-controlled experimental laboratory. See Dickhaut et al. (2003, 29–30) for further comments on manual versus computerized methods in experiments of this genre.

[6] Examples from strategic disclosure experiments include a double auction (King and Wallin 1991b, 1996), second-price auction (King and Wallin 1995), and a computerized market maker (Bloomfield 1996).

In the rounds with ten trials of gain prospects, buyers bid for an asset that yielded either the high or low potential outcome as a liquidating dividend. Buyers began each trial with a fixed $10.00 endowment. The two nonwinning bidders in each trial simply retained this $10.00, whereas the winning bidder paid the seller the amount of the winning bid in exchange for receiving a gain prospect that was known to result with equal probability in either the disclosed potential outcome or the potential outcome that was not disclosed. In the rounds with ten trials of *loss* prospects, all three buyers began each trial with a larger, $15.00 endowment, but all three also faced either a high or low loss, determined in a manner identical to the rounds with gain prospects. The winning bidder paid the seller the amount of his/her bid in exchange for not having to incur the loss prospect, whereas the two nonwinning bidders kept the $15.00 endowment, but had to subtract the actual outcome of the loss prospect. Every other round of ten trials involved gain prospects (loss prospects), with the order counterbalanced across sessions.

In the rounds with *feedback*, all participants were informed after each trial of the amounts bid by each buyer and *both* potential outcomes. In the rounds without feedback, bids and the nondisclosed potential outcomes were kept private between trials. Operationalizing feedback is more problematic than operationalizing gain versus loss prospects, because feedback in early rounds cannot be "taken away" in later rounds. Therefore, in all sessions, the first two rounds (i.e., first 20 trials) withheld feedback, and the last two rounds provided the feedback described above. This procedure limits our ability to infer the cause of any differences in behavior in the last two rounds, as any such differences could be due to (1) bid feedback, (2) feedback regarding the nondisclosed potential outcome, and/or (3) simple learning and convergence over time. However, our interest is not in testing the incremental effect of feedback, per se, but rather is in determining the robustness of our hypotheses to an environment with no feedback and minimal learning (the first two rounds) as compared to extensive feedback and learning (the last two rounds). If we obtain the same conclusions in both environments, then we gain some assurance that our findings are not an artifact of arbitrary assumptions regarding feedback or learning.

Although participants learned the disclosed potential outcome in each trial and learned *both* potential outcomes as feedback after each trial in the last two rounds, we did not determine the equally probable outcome *realizations* for the compensated trials (see below) until the end of the session. This design choice minimized any behavioral influences of unusually lucky or unlucky runs (Thaler and Johnson 1990; Kachelmeier and Shehata 1992, §IV. B.).

Compensation

The instructions explained that, at the end of the session, we would determine by random draw four trials, one from each round of ten, for compensation at the stated rates. For each such trial, buyers received their endowment values ($10.00 for gain trials and $15.00 for loss trials). The winning bidder in each compensated gain trial paid the amount of his/her bid and received the random actual outcome of the gain prospect (high or low), which was determined at this time. The winning bidder in each compensated loss trial paid the amount of his/her bid, while the *nonwinning* bidders lost the outcome of the loss prospect. For both gain and loss trials, the seller received the amount of the winning bid, in addition to a $5.00 seller endowment. Compensation determined in this manner averaged to $40.49 and ranged from $34.50 to $49.50.

Compensating participants at the full rate for a random subset of trials as opposed to paying all trials at a proportionately lower rate presents certain trade-offs.[7] On the plus side, compensating a subset of trials helped us to administer the experiment efficiently, and also minimized any behavioral influences of accumulated outcomes, while retaining the incentive that any given trial could be played out for nontrivial sums of cash (Friedman and Sunder 1994, 51). However, there are at least two potential limitations of this procedure. First, adding another random element to the exercise could exacerbate participants' risk preferences. While we acknowledge this point, none of our hypotheses draw on risk preferences, per se, and we examine both gain and loss trials to counterbalance any such preferences. Second, because participants are aware that only one trial from each round of ten will "count," sellers could be less inclined to engage in complex multiperiod disclosure strategies such as "pool shark" behavior in which a seller chooses suboptimal disclosures in early trials in order to capitalize on a false sense of trust later on (e.g., Dickhaut et al. 2003, 39). We believe that this second potential limitation is desirable for our research objectives, insofar as our intent is to give the single-period strategic disclosure prediction of H2 its best shot in an environment that examines how strategic disclosure bears upon the cognitive anchoring effect predicted in H1. Nevertheless, we raise these issues for future reference, as different objectives could suggest different procedures.

IV. RESULTS

To construct a dependent variable for our tests of bidding behavior (H1, H2, and H3), we subtract the "naive" expected value implied by the seller's disclosure from the winning bid for each trial, resulting in a metric that we refer to as the "standardized winning bid."[8] The "naive" qualifier means that although we adjust expected value computations to take the disclosed potential outcome into account, we *do not* adjust for the strategic discounting predicted by H2. This process allows us to test H2 as a predicted difference, due to strategic discounting that should reduce standardized winning bids only in the strategic-disclosure condition. We later analyze a variety of alternative dependent variable definitions as supplemental evidence.

To construct statistically independent observations, we average the standardized winning bids under both high and low potential outcome disclosures across each round of ten trials. Thus, each session generates eight observations (four rounds × two possible disclosures). To control for the interdependence of the eight observations from each session, we employ repeated-measures ANOVA for the factors varied within sessions (high versus low disclosure, gain versus loss prospects, and a feedback/learning factor to differentiate the first two rounds from the last two). Strategic versus nonstrategic disclosure enters the model as a between-sessions factor.

Table 1 reports descriptive statistics for standardized winning bids, with overall averages plotted in Figure 2 for the two disclosure *forms* (high versus low potential outcome) and *sources* (strategic versus nonstrategic sellers). As an overview of our findings, Figure 2 shows pronounced effects on bids of disclosure form, as predicted by H1, and strategic discounting, as predicted by H2. Moreover, the two lines in Figure 2 are nearly parallel, indicating that these two phenomena are robust to each other (i.e., failing to reject H3). Statistical support for these conclusions is provided by the ANOVA results in Table 2. We

---

[7] Starmer and Sugden (1991) find no discernable behavioral differences due to compensating a random subset of trials versus compensating all trials, but the empirical evidence is limited.

[8] Formally, for a winning bid of B, the standardized winning bid is $B - (.5H + .5[\$0 + \$5.00]/2) = B - .5H - \$1.25$ when the seller discloses a high potential outcome of H, and $B - (.5[\$5.00 + \$10.00]/2 + .5L) = B - \$3.75 - .5L$ when the seller discloses a low potential outcome of L.

TABLE 1
Average Standardized Winning Bids[a] by Treatment Condition (standard deviations in parentheses)

Categorization	Nonstrategic Disclosure	Strategic Disclosure	Nonstrategic – Strategic Difference (H2)
Overall Averages			
High potential outcome disclosed	$0.65 (0.76)	$0.18 (0.32)	$0.47
Low potential outcome disclosed	0.07 (0.51)	−0.46 (0.81)	0.53
High – low difference (H1)	0.58	0.64	
Averages Using Last Five Trials of Each Round[b]			
High potential outcome disclosed	0.69 (0.91)	0.07 (0.45)	0.62
Low potential outcome disclosed	−0.06 (0.67)	−0.46 (0.83)	0.40
High – low difference (H1)	0.75	0.53	
Averages for Gain Prospects			
High potential outcome disclosed	0.22 (0.78)	−0.25 (0.28)	0.47
Low potential outcome disclosed	−0.29 (0.89)	−0.83 (0.98)	0.54
High – low difference (H1)	0.51	0.58	
Averages for Loss Prospects			
High potential outcome disclosed	1.07 (0.96)	0.60 (0.50)	0.47
Low potential outcome disclosed	0.43 (1.14)	−0.10 (0.73)	0.53
High – low difference (H1)	0.64	0.70	

[a] The standardized winning bid is the winning bid less the "naive" expected value that reflects the disclosed potential outcome but does not adjust for the predicted strategic discounting in the strategic-disclosure condition.

[b] Each session consists of four rounds of ten trials each.

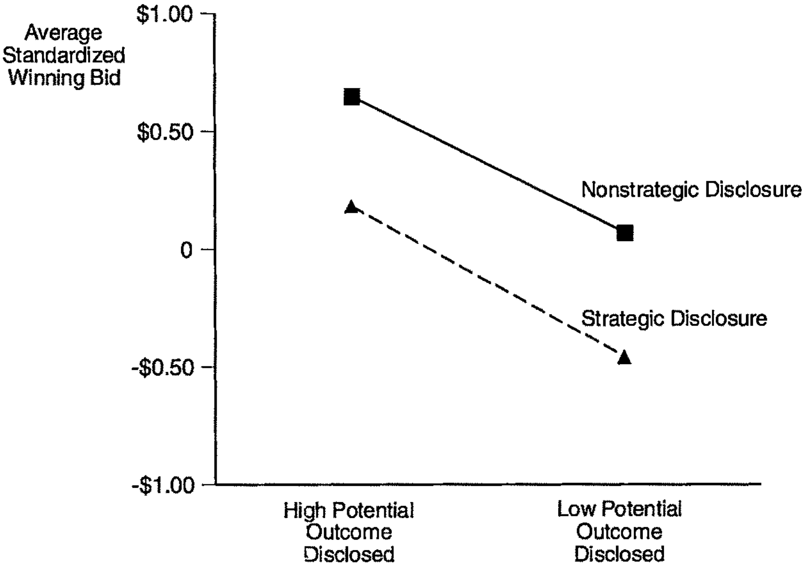
report ANOVAs using averages from all trials within each round and using only the last five trials within each round, with the latter analysis intended to address the potential for learning within rounds. The two ANOVAs generate similar results, so we discuss only the results from the ANOVA using all trials, except as noted below.

Cognitive Anchoring on One-Sided Disclosures (H1)

Relative to the expected values implied by the disclosed potential outcomes, winning bidders paid $0.61 more, on average, when the seller disclosed the high potential outcome than when the seller disclosed the low potential outcome. Table 2 indicates that this difference is statistically significant ($F = 8.80$; $p < .01$), supporting H1. This finding is consistent with the "anchoring and adjustment" model of human information processing and with prior studies of one-sided disclosures (e.g., Kennedy et al. 1998; Dietrich et al. 2001; Koonce et al. 2005).

In addition to the main effect of high versus low disclosure, Table 2 indicates a significant interaction between disclosure form and the feedback/learning factor that separates the first two rounds (of ten trials each) from the last two ($F = 7.31$; $p = .02$). Follow-up investigation indicates that the difference in standardized winning bids under high versus low potential outcome disclosures narrows over time, from a difference of $0.95 in the first two rounds to $0.26 in the last two rounds. This shrinkage could reflect the mitigating effects of feedback, learning, or both. However, it does not appear to have anything to do with strategic disclosure, as the same shrinkage over time occurs in both the strategic and

FIGURE 2
Summary of Findings



The "standardized winning bid" is the difference between the winning bid and the naive (i.e., unadjusted for strategic discounting) expected value of the corresponding risky prospect (see Table 1).

nonstrategic disclosure conditions.[9] Corroborating this assertion, the *three-way* interaction among feedback/learning, high versus low disclosure, and strategic versus nonstrategic disclosure is negligible ($F = 0.01$; $p > .50$).

Strategic Discounting (H2)

Hypothesis 2 predicts lower bids relative to naive expected values in the strategic disclosure condition than in the nonstrategic control condition. We find an average difference of $0.50, which the ANOVA in Table 2 confirms is statistically significant ($F = 2.75$; $p = .06$), albeit slightly above the conventional .05 significance level. The p-value becomes a more modest .09 when using data from the last five trials within each round, but remains marginally significant.

To corroborate the ANOVA, an advantage of H2 is that unlike the simple directional prediction of H1, we can *compute* the predicted strategic discount. Specifically, if sellers adopt the strategy of disclosing the potential outcome that maximizes the implied expected value, then the average "naive" expected value should be $5.42 in the strategic disclosure condition, as opposed to the known central tendency of $5.00 in the nonstrategic

---

[9] Within the strategic (nonstrategic) disclosure condition, the effect on bids of high versus low potential outcome disclosures narrows from $0.97 ($0.94) in the first two rounds to $0.31 ($0.22) in the last two rounds.

TABLE 2
Analysis of Variance for Standardized Winning Bids[a]

Source	ANOVA Using Overall Averages			ANOVA Using Averages from Last Five Trials of Each Round		
	Sum of Squares	F-statistic	p-value[b]	Sum of Squares	F-statistic	p-value[b]
Between-Sessions Factor						
STRATEGIC DISCLOSURE[c]	6.04	2.75	.06	6.18	2.09	.09
Within-Sessions Factors and Interactions						
HIGH versus *LOW DISCLOSURE*[d]	8.87	8.80	< .01	9.86	7.10	.01
GAIN versus *LOSS PROSPECTS*[e]	14.85	7.86	< .01	14.86	7.51	.01
FEEDBACK/LEARNING[f]	13.02	14.50	< .01	11.72	7.68	< .01
STRATEGIC DISCLOSURE × *HIGH* versus *LOW*	0.02	0.02	> .50	0.30	0.21	> .50
STRATEGIC DISCLOSURE × *GAIN* versus *LOSS*	0.00	0.00	> .50	0.11	0.06	> .50
STRATEGIC DISCLOSURE × *FEEDBACK*	2.27	2.53	.14	0.70	0.46	> .50
HIGH versus *LOW* × *GAIN* versus *LOSS*	0.10	0.28	> .50	0.92	2.52	.14
HIGH versus *LOW* × *FEEDBACK*	2.89	7.31	.02	4.69	10.63	< .01
GAIN versus *LOSS* × *FEEDBACK*	1.04	1.71	.22	0.14	0.18	> .50
Three- and four-way interactions	See note g	See note g	See note g	See note g	See note g	See note g

---

[a] Dependent variable = standardized winning bid, the average difference between the winning bids across trials within each round and the naive (i.e., unadjusted for strategic discounting) expected values of the corresponding risky prospects (see Table 1).

[b] The p-values for main effects are one-tailed, conditional on the predicted directions. For interactions, p-values are two-tailed.

[c] *STRATEGIC DISCLOSURE* = binary factor to differentiate the between-sessions manipulation of strategic versus nonstrategic disclosure.

[d] *HIGH* versus *LOW DISCLOSURE* = binary factor to differentiate trials in which the seller disclosed the high potential outcome versus the low potential outcome.

[e] *GAIN* versus *LOSS PROSPECTS* = binary factor to differentiate rounds involving gain versus loss prospects.

[f] *FEEDBACK/LEARNING* = binary factor to differentiate the first two rounds from the last two rounds.

[g] Three- and four-way interactions are omitted to minimize clutter, as none are significant at conventional levels (lowest p = .20 for the three-way *HIGH* versus *LOW* × *GAIN* versus *LOSS* × *FEEDBACK/LEARNING* interaction in the ANOVA using averages from all trials within each round).

condition.[10] The difference of \$0.42 is the predicted average strategic discount. We also determined the average *actual* naive expected value from our strategic disclosure data. This empirical average is \$5.38, suggesting a strategic discount of \$0.38 if buyers adjust fully for the information advantage implied by sellers' actual disclosure choices. Compared to either of these benchmarks, the observed strategic discount of \$0.50 appears reasonable. In sum, consistent with prior studies that find strategic discounting when sellers choose to withhold various disclosures (e.g., King and Wallin 1991a, 1991b, 1995, 1996; Dickhaut et al. 2003), we find that strategic discounting also arises when sellers choose which potential outcome to disclose for assets with uncertain realizations.

Interaction between Anchoring and Strategic Discounting (H3)

The primary contribution of this study is its ability to test both the anchoring on explicit disclosures predicted from cognitive psychology and the strategic discounting predicted from information economics. If asked to conclude which of these predictions best characterizes our data, our simple answer would have to be "Yes." That is, we find that both H1 and H2 are significant and robust to each other, failing to reject null hypothesis H3. As indicated by the nearly parallel lines in Figure 2, buyers pay more when the seller discloses a high potential outcome, even if it is common knowledge that sellers can choose disclosures opportunistically. Similarly, buyers systematically discount strategically chosen disclosures, whether the seller discloses the high potential outcome or the low outcome.

Statistical support for these conclusions derives from the negligible interaction ($F = 0.02$; $p > .50$) between disclosure form (high versus low) and disclosure source (strategic versus nonstrategic). As a follow up, we confirmed that support for H1 remains statistically significant in both the strategic and nonstrategic disclosure conditions, considered separately. We conclude that at least in this setting, the separate influences of cognitive information processing biases and strategic inferences can indeed coincide. Our answer to the qualifications in Kennedy et al. (1998), Dietrich et al. (2001), and other studies is that endogenous, strategic disclosures can result in a systematic shift in user reactions (like the two nearly parallel lines in Figure 2), but do not necessarily negate predictions from cognitive information processing.

Supplemental Analyses of H1, H2, and H3

We supplement tests of the bidding hypotheses (H1, H2, and H3) by redefining the dependent variable in a variety of ways. First, instead of standardizing winning bids by subtracting "naive" expected values, we subtract *strategic* expected values in the strategic disclosure condition, reflecting the predicted strategic discounts that would result from the equilibrium disclosure strategy underlying H2. Second, we standardize by subtracting *clairvoyant* expected values, as if buyers knew sellers' private information about both potential outcomes. Obviously buyers cannot compute clairvoyant expected value, but the measure is nevertheless helpful as a rough test of how well buyers adjust for sellers' *actual* disclosure strategies, taking advantage of the fact that for a large enough sample, average clairvoyant expected values should be the same in the strategic and nonstrategic disclosure conditions. Similar logic drives a third analysis based on winning *raw bids*, without standardization. That is, if buyers adjust bids to offset sellers' actual disclosure strategies, raw bids *averaged across several trials* should not differ between the strategic and nonstrategic disclosure conditions.

---

[10] To compute the \$0.42 predicted average strategic discount, note that if the *maximum* of two independent draws from identical 0-to-1 uniform distributions is X, the *average* of the two draws is $.5X + .5(X/2)$, truncating the distribution of one of the two draws at X. Setting $.5X + .5(X/2) = 1/2$ (the midpoint) yields $X = 2/3$. For our parameters, if sellers disclose an average potential outcome at the two-thirds point in the \$5.00 to \$10.00 range of the high distribution or the \$0 to \$5.00 range of the low distribution, then the "naive" expected value exceeds the truncated expected value by \$0.42. To illustrate for a low disclosure of \$3.33 (two-thirds between \$0 and \$5.00), the "naive" expected value is $.5(\$3.33) + .5(\$5.00 + \$10.00)/2 = \$5.42$, but the truncated expected value is $.5(\$3.33) + .5(\$5.00 + \$8.33)/2 = \$5.00$. A high disclosure of \$8.33 generates identical amounts.

ANOVAs for all three supplemental definitions (not shown) detect higher bids for disclosures of the high potential outcome than for disclosures of the low potential outcome, supporting H1 ($p < .02$ in all cases). All three ANOVAs also indicate no interaction between high versus low disclosure and strategic versus nonstrategic disclosure, failing to reject H3 ($p > .50$ in all cases). Finally, none of these supplemental ANOVAs finds a statistically significant effect of strategic versus nonstrategic disclosure (lowest $p = .29$ when bids are standardized by clairvoyant expected values). This "non-result" is consistent with the conclusions stated earlier in support of H2, because if buyers discount appropriately for the bias in strategic sellers' disclosures, then there should not be any remaining difference in bids using these alternative definitions.

To provide further insight, Figure 3 charts the difference in bids between high versus low disclosure and between nonstrategic versus strategic disclosure for each of the standardized bid definitions described above. The high-low difference is pronounced in all cases. Conversely, the nonstrategic-strategic difference falls from $0.50 to $0.07 when standardizing bids by naive versus strategic expected values, respectively, indicating that buyers' strategic discounts were close to what we would have predicted from the equilibrium logic underlying H2.

Figure 3 indicates that the nonstrategic-strategic difference widens again to $0.37 and $0.28 for bids standardized by clairvoyant expected values and for winning raw bids, respectively, suggesting that average bids were lower in the strategic disclosure condition. These differences are potentially intriguing, because we would expect that if buyers were able to infer sellers' actual disclosure strategies, then average bids would be the same under strategic and nonstrategic disclosure.

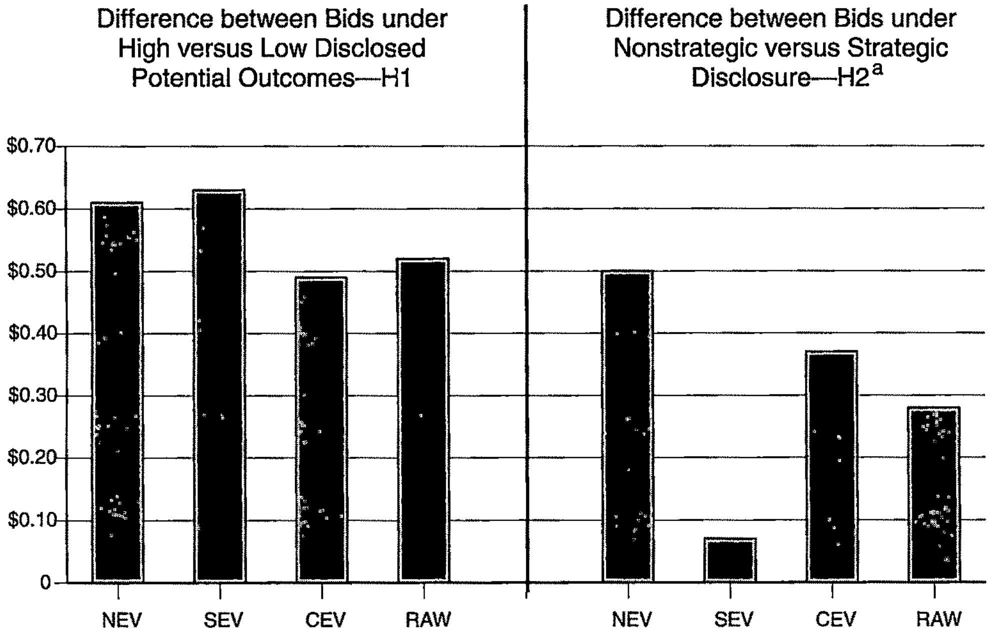
The lower bids in the strategic disclosure condition resulted in buyers paying an average of $0.19 more ($0.20 less) than clairvoyant expected value when the seller disclosed the high (low) potential outcome. Thus, buyers in the strategic disclosure condition were surprisingly adept at paying the true expected value of the prospects they were considering *on average*, albeit paying significantly more for high-potential-outcome disclosures than for low-outcome disclosures. However, we caution against reading too much into findings based on clairvoyant expected value, given the inherent noise in such measures and the fact that the nonstrategic-strategic difference standardized on clairvoyant expected value is not statistically significant.

Last, we return to standardizing bids by naive expected values as in our primary analysis, but using median bids instead of winning bids to gain some comfort that our results are not an artifact of the most aggressive bidder's behavior. Results (not shown) indicate some differences in the relative valuations of gain versus loss prospects, but the conclusions from our tests of H1, H2, and H3 are the same as those from our primary ANOVA in Table 2.

Implications for Strategic Sellers (H4)

We now turn from buyers to examine sellers' choices within the strategic disclosure condition, as tallied in Table 3. First, consistent with the equilibrium disclosure strategy described earlier, Table 3 indicates that strategic sellers disclosed the expected

FIGURE 3
Bidding Effects under Alternative Standardizations



Basis for Standardizing Bids

NEV = Naive Expected Value: Winning bid less the computed expected value that adjusts for the information content of the disclosed potential outcome but does not adjust for the strategic discounting predicted under H2 in the strategic disclosure condition;

SEV = Strategic Expected Value: Winning bid less the computed expected value that adjusts for the information content of the disclosed potential outcome and also adjusts for the strategic discounting predicted under H2 in the strategic disclosure condition;

CEV = Clairvoyant Expected Value: Winning bid less the actual expected value of the risky prospect as computed from both potential outcomes revealed privately to the seller; and

RAW = differences in average raw winning bids, without standardization for expected value.

[a] Hypothesis 1 is consistent with differences in bids between high versus low disclosed potential outcomes for all standardizations described above. Conversely, H2 only predicts a significant difference between bids under nonstrategic versus strategic disclosure for the naive expected value (NEV) standardization, and implies no difference for the other metrics because those metrics already reflect strategic discounting.

value-maximizing potential outcome most of the time. Specifically, of the 240 total disclosures in the strategic condition, 165, or 69 percent, maximized implied expected value (significantly greater than chance at $p < .01$). Second, consistent with H4, sellers disclosed the high potential outcome in 50 of the remaining 75 cases (67 percent; $p < .01$). Put differently, 90 percent of sellers' choices (i.e., 215/240) either maximized implied expected value and/or disclosed the high potential outcome.

Given our earlier conclusion from H3 that buyers paid a premium for high-outcome disclosures even in a strategic environment, this disclosure behavior seems quite reasonable. We cannot necessarily claim that sellers knowingly exploited buyers' cognitive reasoning, but whether wittingly or unwittingly, sellers capitalized somewhat on the tendency of buyers to pay more for disclosures of the high potential outcome.

TABLE 3
Seller Disclosure Decisions in the Strategic Disclosure Condition

	Did the seller's disclosure maximize implied expected value?					
	Yes		No		Not Applicable[a]	
Potential Outcome Disclosed by Seller	High	Low	High	Low	High	Low
Number of trials	79	86	45	24	5	1
Average *difference* in strategic expected value implied by disclosed versus nondisclosed potential outcomes[b]	\$1.55	\$1.63	−\$1.08	−\$1.26	\$0.00	\$0.00
Number of close calls[c]	NA	19	20	NA	NA	NA
Close calls as a percentage of trials	NA	22%	44%	NA	NA	NA

[a] In six of the 240 strategic-disclosure trials, both potential outcomes implied the same expected value of the risky prospect. Sellers disclosed the high potential outcome in five of these six cases.

[b] The "strategic expected value" adjusts for the potential outcome as well as the strategic discounting predicted under H2. We calculated these expected values for both the disclosed and nondisclosed potential outcomes, tabulating the average differences between the two expected values. Positive (negative) differences indicate that the seller maximized (did not maximize) implied expected value.

[c] We define a "close call" as a trial in the strategic disclosure condition in which the low potential outcome maximizes strategic expected value, but by a difference of \$0.72 or less. The \$0.72 cutoff is the estimated "break-even" point at which a seller would be just as well off disclosing the low potential outcome (to secure a greater implied expected value) as the high potential outcome (to secure the H1 premium for high-outcome disclosures). This estimate is calculated from the coefficients of a regression analysis of winning bids on expected values and high versus low disclosures, along with control variables for sessions, gains versus losses, and the first 20 versus last 20 trials in each session.

To dig deeper into this behavior, Table 3 reports the average differences between the expected value implied by the disclosed potential outcome and that implied by the nondisclosed potential outcome.[11] The *average absolute values* of such differences are greater when the seller's disclosure maximizes implied expected value (see Table 3), indicating that when faced with larger differences in implied expected values, sellers tended to maximize such values. Finally, we calculate the frequency of "close calls," defined as cases in which the seller could expect to be better off by disclosing the high potential outcome even when the low outcome would maximize the implied expected value. We estimate the cutoff for a close call from a regression analysis, finding that on average, sellers could expect to be better off by disclosing the high potential outcome if the expected value implied by the low potential outcome exceeds that of the high outcome by \$0.72 or less.[12] Restricting attention to only those trials in which the low potential outcome would have maximized implied expected value, Table 3 indicates that when the seller *disclosed* the low potential outcome, 22 percent (19 out of 86) were close calls, whereas a greater percentage were close calls (44 percent, or 20 out of 45) when the seller did not maximize implied expected value and disclosed the high potential outcome instead.

---

[11] We use "strategic" expected values for this analysis, defined as the expected value that adjusts for both the potential outcome and for the strategic discounting predicted under H2.

[12] To obtain this estimate, we regressed raw winning bids across trials on the expected value implied by the disclosed potential outcome along with an indicator variable for high versus low disclosure and control variables for gain versus loss prospects and the first 20 trials versus last 20, with session-specific intercepts. All coefficients are statistically significant. The expected value coefficient is .77 and the "high/low" coefficient is .55, implying a break-even point of .55/.77 = \$0.72 at which the estimated benefit from disclosing a larger implied expected value from a low potential outcome would exactly offset the average premium buyers paid for high-outcome disclosures. We also estimated close calls separately for the first 20 and last 20 trials, obtaining similar percentage frequencies.

In sum, sellers tended to maximize implied expected value, but favored the high potential outcome at the margin. To be sure, there are some seemingly irrational disclosures, such as the 24 cases (out of 240) in which the seller disclosed the low potential outcome when the high outcome implied a larger expected value, but the overall "error rate" appears modest.[13]

Other Findings

Gain versus Loss Prospects

Table 2 indicates a significant bidding difference between rounds with gain versus loss prospects ($F = 7.86$; $p < .01$). As reflected in Table 1, winning bidders paid $0.79 more, on average, to avoid loss prospects than to obtain gain prospects. The mostly negative (positive) average standardized winning bids for gain (loss) prospects in Table 1 are generally consistent with risk-averse winning bidders, as risk aversion would lead buyers to discount gain prospects and pay a premium to avoid loss prospects. However, the more important point for our research objectives is that any differential bidding behavior for gain versus loss prospects does not interact with the results we observe for either high versus low disclosure or strategic versus nonstrategic disclosure. Thus, our hypotheses appear robust to both the gain and loss domains of risk.

Feedback and Learning

Table 2 also indicates a significant effect of the binary factor we include in the ANOVA to differentiate the first two rounds of ten trials from the last two rounds ($F = 14.50$; $p < .01$). As explained in Section III, this difference could reflect the feedback we provided in the final two rounds and/or a simple learning trend. To explore further, we conducted a time-series regression with average standardized winning bids as the dependent variable and both trial number (from 1 to 40) and an indicator variable for the incremental effect of feedback in the final two rounds as regressors. This regression detects a significant negative trend in bids, which fell by an average of $0.02 per trial ($p < .01$). The feedback indicator variable is also negative, but at a more marginal significance level ($p = .14$, or $p = .07$ for a one-tailed test contingent on the expectation that feedback on competing bidders would lead to lower winning bids).

These results underscore the ambiguity in interpreting differences in the last two rounds as reflecting feedback, *vis-à-vis* the more basic effect of variation over time (or probably both). However, our primary interest is in establishing the robustness of our hypotheses to different environments, rather than discerning the incremental effects of feedback or learning, per se. As reported earlier, the H1 effect of higher bids for high versus low disclosed potential outcomes does indeed appear to be narrowing over time, but this narrowing occurs in *both* the strategic and nonstrategic disclosure conditions, leaving our primary conclusion from H3 intact. At a broader level, we detect *no* significant two-, three-, or four-way interactions that involve both high versus low disclosure and strategic versus nonstrategic disclosure.[14] We also reach largely the same conclusions when using only the last five trials from each round of ten (see Table 2).

---

[13] A possible explanation for some disclosure "errors" as suggested by one seller's open-ended post-experimental questionnaire response is that some sellers may have been trying to build confidence with buyers, similar to the "pool shark" disclosure strategy observed somewhat by Dickhaut et al. (2003, 39). However, this interpretation is conjectural, and seems weakened by the fact that we observed no appreciable differences in disclosure strategies between the last two rounds with feedback and the first two rounds with no feedback.

V. CONCLUSIONS

The accounting literature reflects two different perspectives in describing how users process disclosures. One perspective, grounded in cognitive psychology, views users as boundedly rational decision makers who rely excessively on the format and content of explicit disclosures. Another perspective, grounded in information economics, views users as sophisticated decision makers who draw inferences from disclosures (or the lack thereof) about the private information held by managers. Experiments following the psychological tradition generally manipulate disclosure alternatives as exogenous treatments. Conversely, the cornerstone of the information economics perspective is that disclosed information is *endogenous*, chosen strategically by economic agents with well-defined incentives.

The current study demonstrates that these two perspectives can coincide, notwithstanding their different theoretical underpinnings. First, controlling for expected value, we find that buyers pay more when a seller discloses a high potential outcome of a risky prospect than when a seller discloses a low potential outcome. This finding is consistent with studies of exogenously manipulated one-sided disclosures such as Kennedy et al. (1998), Dietrich et al. (2001), and Koonce et al. (2005). Second, we find that buyers adjust for the seller's information advantage by systematically discounting bids when sellers *choose* disclosures, relative to bids in a control condition in which disclosures are known to be determined randomly. This finding is consistent with studies of strategic reactions to endogenous disclosures in other settings, such as King and Wallin (1991a, 1991b, 1995, 1996), Bloomfield (1996), and Dickhaut et al. (2003).

Our incremental contribution is in showing the robustness of these two phenomena to each other. Specifically, we find that the tendency for buyers to pay more when the seller discloses a prospect's high potential outcome occurs regardless of whether the seller chooses the disclosures. Similarly, the tendency for buyers to discount strategic disclosures is nearly identical whether the seller discloses the high potential outcome or the low potential outcome.

If the biasing effects of human information processing extend to a strategic disclosure environment, then these effects present opportunities that strategic managers can exploit. Indeed, although sellers in our strategic disclosure condition most often disclosed the potential outcome that maximized the implied expected value of the prospect, they exhibited a preference at the margin in favor of disclosing the high potential outcome. More generally, these results suggest motives to favor disclosure options that are more difficult or less difficult for users to process, depending on circumstances. An example might be the overwhelmingly popular option to present comprehensive income as a reconciliation within the Statement of Shareholders' Equity, given the findings of Hirst and Hopkins (1998) and Maines and McDaniel (2000) that this format makes it more difficult to detect earnings volatility. From a policy perspective, regulators contemplating new accounting standards would be well advised to consider both the ease with which users can process information and the corresponding strategic incentives for managers.

---

[14] The lowest p-value of an interaction involving both H1 and H2 is a clearly insignificant $p = .42$ for the four-way interaction among high versus low disclosures, strategic versus nonstrategic disclosures, gain versus loss prospects, and the first two versus last two rounds.

We encourage future research that continues progress on the bridge between the cognitive and strategic aspects of accounting disclosures (Kachelmeier and King 2002). The accounting literature has the comparative advantage of drawing on theoretical roots from both economics and psychology. We can best capitalize on this advantage when we engage theory-driven arguments from both perspectives as empirical questions.

REFERENCES

Arkes, H. R. 1991. Costs and benefits of judgment errors: Implications for debiasing. *Psychological Bulletin* 110 (November): 486–498.

Bloomfield, R. 1996. The interdependence of reporting discretion and informational efficiency in laboratory markets. *The Accounting Review* 71 (October): 493–511.

———, and R. Libby. 1996. Market reactions to differentially available information in the laboratory. *Journal of Accounting Research* 34 (Autumn): 183–207.

———, and T. J. Wilks. 2000. Disclosure effects in the laboratory: Liquidity, depth, and the cost of capital. *The Accounting Review* 75 (October): 13–41.

Brenner, L. A., D. J. Koehler, and A. Tversky. 1996. On the evaluation of one-sided evidence. *Journal of Behavioral Decision Making* 9 (March): 59–70.

Dickhaut, J., M. Ledyard, A. Mukherji, and H. Sapra. 2003. Information management and valuation: An experimental investigation. *Games and Economic Behavior* 44 (July): 26–53.

Dietrich, J. R., S. J. Kachelmeier, D. N. Kleinmuntz, and T. J. Linsmeier. 2001. Market efficiency, bounded rationality, and supplemental business reporting disclosures. *Journal of Accounting Research* 39 (September): 243–268.

Dye, R. A. 1985. Disclosure of nonproprietary information. *Journal of Accounting Research* 23 (Spring): 123–145.

———. 2001. An evaluation of "essays on disclosure" and the disclosure literature in accounting. *Journal of Accounting and Economics* 32 (December): 181–235.

Epley, N., and T. Gilovich. 2004. Are adjustments insufficient? *Personality and Social Psychology Bulletin* 30 (April): 447–460.

Friedman, D., and S. Sunder. 1994. *Experimental Methods: A Primer for Economists.* New York, NY: Cambridge University Press.

Grossman, S. 1981. The informational role of warranties and private disclosure about product quality. *Journal of Law and Economics* 24 (December): 461–483.

Hirshleifer, D., and S. H. Teoh. 2003. Limited attention, information disclosure, and financial reporting. *Journal of Accounting and Economics* 36 (December): 337–386.

Hirst, D. E., and P. E. Hopkins. 1998. Comprehensive income reporting and analysts' valuation judgments. *Journal of Accounting Research* 36 (Supplement): 47–75.

Hopkins, P. E. 1996. The effect of financial statement classification of hybrid financial instruments on financial analysts' stock price judgments. *Journal of Accounting Research* 34 (Supplement): 33–50.

———, R. W. Houston, and M. F. Peters. 2000. Purchase, pooling, and equity analysts' valuation judgments. *The Accounting Review* 75 (July): 257–281.

Jung, W., and Y. K. Kwon. 1988. Disclosure when the market is unsure of information endowment of managers. *Journal of Accounting Research* 26 (Spring): 146–153.

Kachelmeier, S. J., and M. Shehata. 1992. Examining risk preferences under high monetary incentives: Experimental evidence from the People's Republic of China. *The American Economic Review* 82 (December): 1120–1141.

———. 1996. Discussion of: Tax advice and reporting under uncertainty: Theory and experimental evidence. *Contemporary Accounting Research* 13 (Spring): 81–89.

———, and R. R. King. 2002. Using laboratory experiments to evaluate accounting policy issues. *Accounting Horizons* 16 (September): 219–232.

Kennedy, J., T. Mitchell, and S. E. Sefcik. 1998. Disclosure of contingent environmental liabilities: Some unintended consequences? *Journal of Accounting Research* 36 (Autumn): 257–277.

King, R. R., and D. E. Wallin. 1990. The effects of antifraud rules and ex post verifiability on managerial disclosures. *Contemporary Accounting Research* 6 (Spring): 859–892.

———, and ———. 1991a. Voluntary disclosures when seller's level of information is unknown. *Journal of Accounting Research* 29 (Spring): 96–108.

———, and ———. 1991b. Market-induced information disclosures: An experimental markets investigation. *Contemporary Accounting Research* 8 (Fall): 170–197.

———, and ———. 1995. Experimental tests of disclosure with an opponent. *Journal of Accounting and Economics* 19 (February): 139–167.

———, and ———. 1996. Managerial incentives for disclosure timing: An experimental investigation. *Journal of Management Accounting Research* 8: 117–136.

———. 1996. Reputation formation for reliable reporting: An experimental investigation. *The Accounting Review* 71 (July): 375–396.

Koonce, L., M. G. Lipe, and M. L. McAnally. 2005. Judging the risk of financial instruments: Problems and potential remedies. *The Accounting Review* 80 (July): 871–895.

Libby, R., R. Bloomfield, and M. W. Nelson. 2002. Experimental research in financial accounting. *Accounting, Organizations and Society* 27 (November): 775–810.

Luft, J. 1997. Fairness, ethics, and the effect of management accounting on transaction costs. *Journal of Management Accounting Research* 9: 199–216.

Maines, L. A., and L. S. McDaniel. 2000. Effects of comprehensive-income characteristics on nonprofessional investors' judgments: The role of financial statement presentation format. *The Accounting Review* 75 (April): 179–207.

Milgrom, P. 1981. Good news and bad news: Representation theorems and applications. *Bell Journal of Economics* 12 (Autumn): 380–391.

Moser, D. V. 1998. Using an experimental economics approach in behavioral accounting research. *Behavioral Research in Accounting* 10 (Supplement): 94–110.

Payne, J. W., J. R. Bettman, and E. J. Johnson. 1993. *The Adaptive Decision Maker*. New York, NY: Cambridge University Press.

Shin, H. S. 1994. News management and the value of firms. *RAND Journal of Economics* 25 (Spring): 59–71.

Starmer, C., and R. Sugden. 1991. Does the random-lottery incentive system elicit true preferences? An experimental investigation. *The American Economic Review* 81 (September): 971–978.

Thaler, R. H., and E. J. Johnson. 1990. Gambling with the house money and trying to break even: The effects of prior outcomes on risky choice. *Management Science* 36 (June): 643–660.

Tversky, A., and D. Kahneman. 1974. Judgment under uncertainty: Heuristics and biases. *Science* 185 (September 27): 1124–1131.

THE ACCOUNTING REVIEW
Vol. 80, No. 3
2005
pp. 847–870

Valuing Loss Firms

Peter Joos
Baruch College of the City University of New York

George A. Plesko
University of Connecticut

ABSTRACT: We investigate whether investors price losses conditional on the likelihood of the firm's return to profitability, consistent with the abandonment option hypothesis (Hayn 1995). We first develop a loss-reversal model to define subsamples of persistent and transitory losses. We find that on average investors price transitory losses positively over the sample period, as if a transitory loss indicates a low likelihood of exercising the abandonment option. We also observe that early in the sample period investors do not price persistent losses, as predicted by the abandonment option hypothesis. By contrast, later in the sample period, larger persistent losses correspond to higher returns, inconsistent with the prediction of the abandonment option hypothesis. To understand why we observe a change in the valuation of persistent losses over the sample period, we study their components and establish the key role of R&D for their valuation. We find that investors do *not* price persistent losses without an R&D component, consistent with these losses indicating financial distress and a higher likelihood of exercising the abandonment option. However, when persistent losses contain R&D, investors separately value the R&D component as an asset and the non-R&D component *as if* it is a transitory loss. Thus, investors do not consider losses to be homogeneous, but consider the causes and nature of the loss to assess its long-term implications for firm value.

Keywords: *earnings; losses; cash flows; accruals; valuation; persistence; R&D.*

Data Availability: *Data are available from sources identified in the text.*

I. INTRODUCTION

The frequency of firms reporting losses has markedly increased over the last three decades. While only 15 percent of observations covered by the Standard & Poor's Compustat database report a loss during the 1970s, loss observations constitute about 35 percent of the U.S. firm-year observations by the 1990s. The increased frequency of firms reporting losses poses an important challenge for financial statement users who rely

---

We thank Jeff Abarbanell, Sid Balachandran, Karen Teitel, SP Kothari, Sugata Roychowdhury, Gim Seow, Joe Weber, Mike Willenborg, Peter Wysocki, two anonymous referees, and participants of accounting workshops at the Massachusetts Institute of Technology, University of Connecticut, the 2002 European Accounting Association, the Thirteenth Annual Conference on Financial Economics and Accounting at the University of Maryland, and Baruch College CUNY for helpful comments on earlier drafts. A previous version of this paper was titled "Loss Reversals and Earnings-Based Valuation." All errors are our own.

Editor's note: This paper was accepted by Terry Shevlin, Senior Editor.

Submitted June 2003
Accepted October 2004

on accounting earnings in various decision contexts (Watts and Zimmerman 1986). In the context of valuation, Modigliani and Miller (1966) discuss in their seminal paper how accounting earnings are a proxy for the expected and unobservable earning power of firms' assets. They note that losses complicate the use of earnings-based valuation models, since a loss reduces the ability of reported earnings to provide information about the earning power of a firm's assets. Given the increase in the frequency of losses in the cross-section, the question of how investors price negative earnings has gained considerable relevance. In this study, we hypothesize that investors, when confronted with a loss, assess the probability of loss reversal (i.e., the firm's return to profitability) and price earnings conditional upon that probability.

We focus on loss reversals because a loss places the firm in a temporary position: a return to profitability is the maintained hypothesis of financial reporting, embodied in the going-concern assumption. In addition, the assumption that a loss is temporary is consistent with the abandonment option hypothesis, studied by Hayn (1995). The abandonment option hypothesis suggests that shareholders of loss firms will redeploy or liquidate the assets of the firm if they expect the loss to continue (Hayn 1995, 126; Berger et al. 1996; Wysocki 2001).[1] Hayn (1995, 127) argues that losses represent a case where current earnings signal that future earnings will be low enough to make the abandonment option attractive. Accordingly, Hayn (1995) predicts loss observations will dampen cross-sectional estimates of earnings response coefficients and earnings-returns correlations, as investors stop valuing the firm strictly on the basis of reported earnings. She reports evidence consistent with her prediction and similarly observes a larger positive price response to a loss when the likelihood of exercising the abandonment option is relatively smaller.

Building on Hayn (1995), we propose a proxy for the likelihood of exercising the abandonment option based on an expectation of loss reversal.[2] We show that investors can use concurrent and past financial information to estimate the probability of loss reversal. To assess if the valuation of losses varies as a function of the estimated loss reversal probability, we focus on two groups of firms, defined by their likelihood of reversal: the persistent loss group consists of observations with the lowest estimated probabilities of loss reversal, and the transitory loss group consists of observations with the highest estimated probabilities. We predict that if persistent losses indicate a high likelihood of exercising the abandonment option, then the earnings response coefficient (ERC) in the persistent-loss group will not be significantly different from zero. In other words, we predict that investors do not evaluate persistent-loss firms on the basis of their reported earnings since the persistent losses are not informative about the future prospects of the firm, but instead indicate a situation where abandonment is attractive (see Hayn 1995, 127). By contrast, if transitory losses indicate a low likelihood of exercising the abandonment option, then we predict that the ERC in the transitory-loss group will be positive and significantly different from zero.

Using a sample of loss observations from 1971 through 2000, we find that a parsimonious set of financial variables is able to predict a return to profitability (i.e., loss reversal). As the change in frequency of losses over time potentially implies a change in their characteristics and reversal probabilities, we use successive seven-year panels spanning the sample period to estimate each loss firm's reversal probability in the next year. We find, consistent with the overall increase in the number of loss firms in the population of firms, that the average estimated probability of reversal declines over the sample period.

---

[1] As Watts (2003) describes, the abandonment option does not require the liquidation of the firm since management can opt to liquidate only the unprofitable investments within the firm, thereby leaving only those operations that are profitable. Given that liquidation of publicly traded firms is a relatively rare event, this characterization is consistent with observed empirical patterns.

[2] A number of other studies, such as Burgstahler and Dichev (1997), Collins et al. (1997), and Collins et al. (1999), also study firm valuation in the presence of losses and use book value as a proxy for the abandonment value of the firm.

Focusing on valuation, we find the annual ERC in the transitory group is on average significantly positive, consistent with our prediction. We also document that investors' valuation of transitory losses remains unchanged over the sample period. By contrast, while the ERC in the persistent group is on average not significantly different from zero, as predicted, the time-series analysis indicates the pattern of annual ERCs contains an important trend. Specifically, we find the ERCs in the persistent group become significantly negative, implying that larger persistent losses correspond to higher returns over time. Importantly, the changing ERCs suggest that investors' valuation of persistent losses becomes inconsistent with the prediction of the abandonment option hypothesis over time.

To understand why investors appear to change their valuation of persistent losses over the sample period, we study the components of reported losses. Building on Givoly and Hayn (2000), we find that the relative magnitudes of the cash flow and accruals components of persistent, but not of transitory, losses change over time. Specifically, we observe the growing presence of a large negative cash flow component being the key difference between persistent and transitory losses. Prompted by recent research documenting the effect of increased R&D expenditures on the properties of earnings (e.g., Amir and Lev 1996; Collins et al. 1997; Lev and Zarowin 1999), we find that a large and increasing R&D component in persistent losses contributes to the cash flow result. Since the descriptive evidence suggests the growing R&D presence in persistent losses coincides with both their increased persistence and their change in valuation over time, we hypothesize that the presence of R&D explains why the valuation of persistent losses changes.

To test the hypothesis, we distinguish between two subgroups of persistent losses based on whether the losses contain an R&D component. We predict that persistent losses *without* an R&D component indicate financial distress and a high likelihood of exercising the abandonment option; accordingly, we predict that investors do *not* respond to the magnitude of the loss in this subgroup of persistent losses. By contrast, for persistent losses *with* an R&D component, we predict investors will price the R&D component as an asset. Further, we predict that, given the presence of R&D, investors will consider the non-R&D component of a persistent loss to be transitory and respond to its magnitude by pricing it positively, consistent with the abandonment option hypothesis. The evidence is consistent with our predictions. Additionally, when we focus on aggregate cash flows and accruals, our results corroborate the specific role of R&D in the pricing of persistent losses.

Summarizing, our research establishes three contributions to the valuation literature. First, we confirm and extend Hayn's (1995) findings on the abandonment option explanation of the pricing of losses. We show investors' valuation of losses varies cross-sectionally as a function of their *ex ante* persistence. That is, investors do not consider losses to be homogeneous, but value persistent and transitory losses differently. Our findings emphasize that investors exhibit sophistication in assessing the causes and nature of the loss to assess its long-term implications for firm value.

Second, we document the growing presence of a large negative cash flow, and in particular a large and increasing R&D component in persistent losses, as a key difference between persistent and transitory losses. This result for loss observations contrasts with the general findings of Givoly and Hayn (2000), who show that the observed decline in profitability of U.S. firms over time does not follow from a decline in cash flows, but rather from a decline in accruals. While our evidence shows that persistent losses become less negative over time, it also indicates that the growing cash flow and R&D components contribute to the increase in persistence.

Third, we document that consideration of the R&D component is key to understanding investors' valuation of persistent losses. Our evidence is consistent with the valuation of persistent losses depending on whether the persistence of the loss indicates the firm is truly in distress, making the exercising of the abandonment option more likely, or relates to the firm making R&D investments that, while immediately expensed under U.S. GAAP, are indicative of better performance in the future. We find that investors use information beyond aggregate earnings, cash flows, and accruals to distinguish between both settings when they value the firm in the increasingly common case when the firm reports a persistent loss.

In Section II we describe our sample and document the prevalence and duration of losses. In Section III we describe the financial profile of loss observations and present our model of loss reversals, followed in Section IV by our tests of valuation as a function of loss persistence. In Sections V and VI we study the changing properties and valuation of loss components in providing information to the market. Section VII summarizes and concludes.

II. THE PREVALENCE AND DURATION OF LOSSES

We collect our sample of firm-year observations from Compustat's Industrial and Research Annual Data Bases for the years 1971–2000. Consistent with Hayn (1995), we define earnings as income (loss) before extraordinary items and discontinued operations [hereafter IB] (annual Compustat data item #18). Our initial sample contains 217,085 firm-year observations, of which 29.63 percent are loss observations.

As shown in Figure 1, the incidence of losses has increased over the past 30 years. Similar to Hayn (1995, Table 1) and to patterns reported in Givoly and Hayn (2000) and Klein and Marquardt (2003), we find that the number of loss observations (i.e., firms with negative amounts for IB) increases over time. From 1971 to 1980, loss observations represent less than 20 percent of the sample in each year. From 1981 to 1984, loss firms' share of the sample increases from 21.42 percent to 28.67 percent. From 1985 through 2000, loss firms constitute more than 30 percent of all observations, and more than 40 percent in 1998 and 2000.[3]

In the first two columns of Panel A of Table 1, we document the distribution of the number of years with losses based on a sample of 11,435 firms with at least seven years of observations.[4] Panel A shows that only 27.21 percent of the firms in our sample never incur a loss over the period studied. By contrast, about 10 percent of firms incur ten or more losses over this 30-year period. Similar to the first two columns, the next two columns show the distribution of the number of years with losses based on a sample of 885 firms with observations for the entire 30-year sample period. We find that, while about one-third of firms never incur a loss during the sample period, more than 10 percent of firms report ten or more losses over the period, suggesting that losses can persist for long periods of time.

---

[3] We observe a similar pattern when we define a loss as a negative net income observation (Compustat data item #172).

[4] The seven-year criterion allows us to study loss history over a longer window for a subset of firms in a later analysis. To mitigate possible effects of survivorship bias we code a firm as non-reversing if it is dropped from the Compustat Annual File due to bankruptcy or liquidation but still appears in the Research File. As in Figure 1, a similar pattern exists if we define a loss as negative net income.

FIGURE 1
Loss Firms as a Percent of All Firms

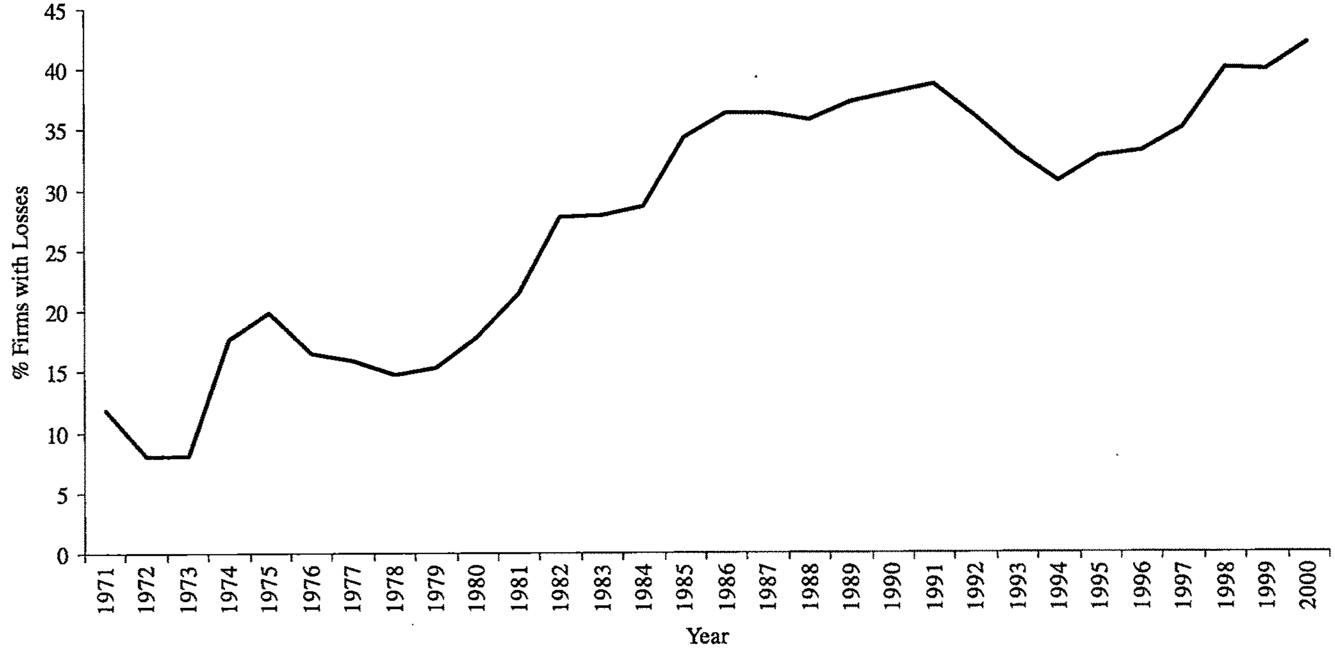


Figure 1 is based on data collected from Compustat's Industrial and Research Annual Data Bases and cover the period 1971–2000. The figure represents the percentage of each year's observations in the sample reporting negative income (losses) where we define negative income as income (loss) before extraordinary items and discontinued operations (annual Compustat data item #18).

TABLE 1
Frequency of Losses and Loss Reversals

Panel A: Distribution of the Number of Years with Losses[a]

	Firms with at Least 7 Years of Data		Firms with 30 Years of Data	
	No. Firms	**% of Firms**	**No. Firms**	**% of Firms**
Total	11,435	100.00	885	100.00
Number of losses				
0	3,112	27.21	297	33.56
1	1,396	12.21	159	17.97
2	1,102	9.64	89	10.06
3	934	8.18	62	7.01
4	855	7.48	49	5.54
5	715	6.25	36	4.07
6	647	5.66	35	3.95
7	653	5.71	31	3.50
8	522	4.56	22	2.49
9	377	3.30	15	1.69
10	291	2.54	22	2.49
10 < and < 20	806	7.05	61	6.89
20 or more	25	0.22	7	0.79

Panel B: Relation between Length of Loss Sequence and Reversal One Year into the Future[b]

Length of Loss Sequence	Obs.	Reversal (%)
1 year	10,234	45.47
2 years	5,055	34.76
3 years	2,968	31.17
4 years	1,787	27.98
5 years	1,118	27.55

Panel C: Loss Reversal in the Current Loss Sample as a Function of the String of Past Losses[b]

Future Reversal	Loss Sequence (number of years)				
	1	**2**	**3**	**4**	**5**
Obs.	6,983	3,356	1,882	1,096	621
1 year	46.79	36.77	33.63	32.66	31.88
2 years	19.32	21.31	20.94	21.35	17.71
3 years	11.28	13.02	13.71	12.04	12.08
4 years	6.60	8.34	7.86	7.57	7.73
5 years	4.41	4.95	5.42	4.93	5.48
>5 years	11.60	15.61	18.44	21.44	25.12

---

[a] The data are collected from Compustat's Industrial and Research Annual Data Bases and cover the period 1971–2000. Losses are based on IB, defined as income (loss) before extraordinary items and discontinued operations (annual Compustat data item #18).

[b] *Loss sequence* refers to an uninterrupted sequence of annual losses. *Reversal* indicates the loss firm becomes profitable.

To preface our focus on loss reversals in the following section, we show in Panels B and C of Table 1 how a firm's return to profitability varies as a function of its recent loss history. Panel B documents how the likelihood of reversal in the next year relates to the sequence of prior losses. Of firms experiencing a first loss during the sample (i.e., the loss sequence is one year) 45.47 percent are profitable the next year. However, the percentage of firms reversing decreases drastically and monotonically as a function of the past history of losses. For firms with two consecutive losses, the probability of reversal decreases to 34.76 percent; for firms with five consecutive losses, it is 27.55 percent.

Panel C of Table 1 documents how the pattern of reversal over a five-year horizon varies as a function of the sequence of prior losses. The analysis reduces the number of observations as it imposes substantial restrictions on our dataset, requiring ten consecutive observations for each loss firm (the current year observation, four past observations, and five future observations). We find for the 6,983 firm-year observations where the current loss is the first in a (potential) sequence, 46.79 percent of observations return to profitability the next year, and 11.60 percent do not reverse within five years. For losses that do not immediately reverse, the conditional probability of reversing in subsequent years declines monotonically, from 36.77 percent after two losses to 31.88 percent after five years. Each column of Table 1 shows a pattern similar to the rows, i.e., the relative magnitude of the reversal percentages declines as a function of the length of the loss sequence of the firm. For example, in the last column, consisting of 621 firms where the current loss is the fifth in the sequence, less than a third reverse the following year, and about a quarter of the observations do not reverse over the five-year horizon.

Taken together, the descriptive evidence in Panels B and C of Table 1 suggests that loss reversals follow a distinct pattern conditional on the number of prior losses: the longer the loss sequence, the lower the *ex ante* probability the current loss will eventually reverse, presenting particular challenges for fundamental analysis and/or valuation of the firm.

III. LOSS-REVERSAL MODEL

The increased frequency of losses requires investors to consider information other than aggregate accounting earnings when valuing loss firms, since negative earnings are a poor measure of the earning power of a firm's assets. We hypothesize that investors will price the earnings of a loss firm conditional on whether they expect the loss to reverse.

To test our prediction, we carry out a two-step analysis. First, we estimate a proxy for investors' *ex ante* assessment of the persistence of an observed loss. Next, we use the estimated reversal probability to classify observations into either a persistent or transitory subsample, and estimate ERCs in each sample.[5] As a starting point, we observe in Table 1 that losses can persist for a number of years, i.e., a current loss does not necessarily reverse to profitability in the immediate future. However, the results in Panel C of Table 1 show that regardless of the number of losses a firm has experienced, the unconditional probability of reversal is always highest in the following year. Therefore, we focus on loss reversal in the next year to estimate our proxy for investors' *ex ante* assessment of the persistence of an observed loss and the likelihood of exercising the abandonment option. Specifically, we estimate a model of loss reversal based on factors related to the firm's business environment and operations as follows:

---

[5] Our approach is similar to Chambers (1996, 9), who argues "investors estimate initial-loss persistence using information available at the time of the initial loss." However, his definition of persistence is different from ours, making the results noncomparable. While we define persistence in reference to the *ex ante* probability of loss reversal, Chambers defines persistence as "the ratio of *ex post* observed present value of total loss-period negative earnings scaled by initial-year losses" (Chambers 1996, 11). Using his definition, losses reversing after a different number of years can exhibit similar persistence.

$$y_{t+1} = X_t\beta + \varepsilon_{t+1} \tag{1}$$

where y_{t+1} is an indicator variable equal to 1 if the firm becomes profitable in the subsequent period, and 0 otherwise, X_t represents the information variables of the model, and ε_{t+1} is an error term.

Our research design allows for the possibility that the nature and properties of losses have changed over our sample period. Not only do Figure 1 and the results of other studies (e.g., Hayn 1995; Klein and Marquardt 2003) show that the frequency of losses increases substantially over the sample period, but several recent studies illustrate that the properties and valuation of earnings have changed in recent decades (e.g., Collins et al. 1997; Givoly and Hayn 2000). Since it is possible that the changing nature of earnings over our sample period influences the increased occurrence and/or valuation of losses, we estimate Equation (1) sequentially using rolling sample years. That is, we estimate Equation (1) annually and compute predicted reversal probabilities using information from the current year and five-years prior to the year of estimation. For example, to estimate Equation (1) in 1976, our earliest year of estimation (i.e., $t = 1976$), we use data from 1971 ($t-5$) to 1976 to compute the independent variables in the model; we construct the dependent variable in the model by observing whether the 1976 loss reversed in 1977 (i.e., $t+1 = 1977$). We repeat the estimation procedure using successive panels of data, each time dropping the oldest year and adding a new year, over the entire sample period. As such, the methodology yields time-varying parameters of Equation (1) to obtain predictions of the loss firm's probability of reversal.

In the absence of a structural model of loss reversals, we estimate our proxy for investors' *ex ante* assessment of loss persistence by including three broad categories of (accounting) variables in Equation (1).[6] Our first set of variables measures the financial profile of the firm. In a first specification of the model, we measure profitability using return on assets (*ROA*) as income before extraordinary items (annual Compustat data item #18) scaled by lagged total assets (annual Compustat data item #6). We include both contemporaneous *ROA* and a past five-year average *PAST_ROA*. We predict positive signs on both *ROA* and *PAST_ROA*, consistent with higher profitability (i.e., less negative *ROA* or *PAST_ROA*) indicating a higher probability of a return to profitability.

In a second specification, we decompose *ROA* into its cash flow and accrual components. We define *CFO* as cash flow from operations scaled by lagged total assets. Consistent with previous literature (Hayn 1995), we measure cash flow from operations as net income (annual Compustat data item #172) − accruals. We measure accruals or *ACC* as ΔCurrent Assets (data item #4) − ΔCash (data item #1) − ΔCurrent Liabilities (data item #5) + ΔDebt in Current Liabilities (data item #34) + Depreciation and Amortizations (data item #14), scaled by lagged total assets.[7] We decompose earnings into cash flows and accruals for two reasons. First, Givoly and Hayn (2000) document that the properties of cash flows and accruals have changed over the period we study. Specifically, they find that an increase in the amount of negative nonoperating accruals, rather than changes in cash flows, is responsible for the observed decline in profitability.[8] Second, we expect long-term accruals will mechanically influence loss reversal. For example, for firms with acquisitions accounted for as purchases, goodwill amortization is likely to reduce earnings for a number of years. By separating earnings into its cash flow and accruals components, we are able to assess whether cash flows and accruals reflect different information about future loss reversals.[9] As in the *ROA* specification, we include contemporaneous and past *CFO* and *ACC* in the model, where we measure *PAST_CFO* and *PAST_ACC* as the average over the past five years. Consistent with our *ROA* specification, we predict positive coefficients on all cash flow and accrual variables.

---

[6] Our objective is to obtain a reasonable proxy for investors' *ex ante* assessment of the persistence of the current loss using accounting information. We evaluated different specifications of the model, incorporating other financial profile variables of the firm such as the variables in Piotroski (2000), Altman's Z-score (Altman 1968), and macro-economic variables as in Klein and Marquardt (2003). We find the current parsimonious set of variables performs qualitatively similarly to expanded sets of variables in the reversal model. Importantly, the different reversal model specifications had no qualitative impact on our later earnings response coefficient analysis.

To complement the profitability variables, we include size and growth variables in the model. We include size since Hayn (1995) documents a strong link between the occurrence of losses and firm size. We expect a positive coefficient on *SIZE*, measured as the log of current market value (annual Compustat data item #199 * annual Compustat data item #25), consistent with large firms being financially stronger than small firms and therefore more easily able to return to profitability. We include a measure of growth to control for the possibility that current earnings do not fully capture the future prospects of growing firms (see Hayn 1995, 148). Our proxy for growth is recent growth in sales, *SALESGROWTH*, measured as the percentage growth in sales (annual Compustat data item #12) during the current year. Although we expect sales growth to be positively associated with the likelihood of a return to profitability, the effect is weakened if high sales growth identifies relatively young firms in the sample that have not yet achieved profitability. Young firms can remain unprofitable for a number of years during the early stages of their lives so that sales growth will not be a good predictor of loss reversals.[10]

Our second set of variables measures the incidence and frequency of past losses. We include two variables that characterize the past loss sequence to complement the (continuous) *ROA* or *CFO* and *ACC* variables that measure the profitability of the firm in the recent past. *FIRSTLOSS* is an indicator variable equal to 1 if the current year's loss is the first in a sequence (i.e., the firm was profitable the prior year), and 0 otherwise. Based on the patterns in Table 2, we expect the coefficient on *FIRSTLOSS* to be positive: if the current loss is the first in a sequence, the probability of loss reversal is 0 relative to other loss firms. We also include a variable to capture the number of losses in the sequence over the past five years: *LOSS_SEQ* is a count of the number of sequential losses over the past five years before the current loss. Based again on the descriptive evidence in Table 2, we expect a negative coefficient on *LOSS_SEQ* as the longer a firm has been incurring losses, the less likely it is to return to profitability in the next year.

---

[7] Hribar and Collins (2002), among others, discuss how using the balance sheet and income statement to define cash flows introduces measurement error, especially for firms with M&A activity. However, since the statement of cash flows is only available since 1987 we use the balance sheet definition to maintain consistency over our sample period starting in 1971.

[8] Givoly and Hayn (2000, 303–304) define nonoperating accruals as total accruals (before depreciation) minus operating accruals (e.g., bad debt provisions, restructuring charges, asset write-downs).

[9] In additional (unreported) analysis, we re-estimate Equation (1) using EBITDA or operating income before depreciation (annual Compustat data item #13), scaled by lagged assets, and Depreciation and Amortization (annual Compustat data item #14) scaled by lagged total assets in the model. We find that, whereas EBITDA helps predict future loss reversal (i.e., its coefficient is positive and significant), the coefficient on Depreciation and Amortization is generally not significant.

[10] We require each observation in the sample to have a history of five years of data before the current loss observation. As a result, our sample does not include recent IPOs. In unreported analysis, we find a variable capturing age of the firm relates to the probability of loss reversal, i.e., older firms revert to profitability faster than younger firms. Multivariate analyses however suggest size and age of the firm contain similar information regarding the probability of loss reversal.

Finally, since prior research relates dividend policy to a firm's future earnings, a third category of explanatory variables measures the dividend-paying behavior of the firm. Healy and Palepu (1988) show that management signals profitability changes through dividend changes. With respect to underperforming firms, DeAngelo and DeAngelo (1990) show that dividend changes relate to persistent losses while DeAngelo et al. (1992) show information about dividend reductions increases the ability of current earnings to predict future earnings. Recently, Skinner (2004) shows that losses of dividend-paying firms are likely to be less persistent than losses of non-dividend-paying firms. We therefore include two indicator variables to capture the dividend behavior of the firm. First, we define *DIVDUM* to be equal to 1 if the firm is paying dividends (annual Compustat data item #21), and 0 otherwise. We predict a positive coefficient on *DIVDUM*, consistent with firms continuing to pay dividends while incurring losses, signaling that they expect the loss sequence will be brief.[11] Second, we include *DIVSTOP*, an indicator variable equal to 1 if a firm stops paying dividends in the current year, and 0 otherwise. Based on the results of Healy and Palepu (1986) and DeAngelo et al. (1992), we predict the coefficient on *DIVSTOP* will be negative.[12]

Table 2 presents descriptive statistics for the variables included in the logistic regression. Panel A shows a first loss is significantly associated with loss reversal: when the current loss is the first in a sequence (i.e., *FIRSTLOSS* = 1) 44.65 percent of losses reverse compared to 25.19 percent when the current loss occurs after a previous loss (the χ^2-statistic for the difference in the reversals is also highly significant). Panel A further shows *DIVDUM* significantly relates to the probability of loss reversal (p-value of χ^2-statistic is 0.001). Consistent with our expectation, the probability of loss reversal for a firm paying dividends is 53.72 percent compared to 28.70 percent for a firm not paying dividends. We also find that a relatively small number of sample firms eliminates their dividends in the same year as the loss (776 out of 18,274, or 4.24 percent), with no statistically significant difference in the probability of reversal between them and other loss firms.[13]

Panel B of Table 2 provides descriptive statistics for the continuous and ordinal variables used in the model. We present statistics for the full sample of observations and for two samples based on the *ex post* observed loss reversal. In general, the pattern of the variables suggests that, consistent with expectations, firms with reversing losses experience better (less negative) profitability, are larger, and have shorter loss sequences than firms whose losses do not reverse the next year. By contrast, median *ACC* and mean *SALESGROWTH* exhibit no difference between our persistent and transitory loss samples.

Table 3 reports the results of two specifications of Equation (1) computed using the Fama and MacBeth (1973) procedure.[14] In the first column (Specification I), we include

---

[11] Joos and Plesko (2004) investigate the dividend-signaling hypothesis in a sample of loss firms and find that dividend increases by loss firms with negative cash flows constitute a strong signal of future performance improvements.

[12] While DeAngelo et al. (1992) focus on dividend cuts, Healy and Palepu (1986) focus specifically on dividend omissions.

[13] The percentage is less than the 15 percent DeAngelo et al. (1992) report; however. they condition their sample on identifying dividend paying firms first, a restriction we do not impose.

[14] Note that in Table 2 we present the descriptive statistics for the sample pooled over time. In Table 3 we present averages of coefficients based on annual estimations of the models. The reported sample size in the Panel A of Table 3 therefore represents an *average* sample size.

TABLE 2
Logistic Regression Model of Loss Reversal: Descriptive Statistics[a]

Panel A: Indicator Variables[b]

Variable	Value	Obs.	Reversal (%)	χ^2 p-value
FIRSTLOSS	0	11,253	25.19	.000
	1	7,021	44.65	
DIVDUM	0	15,374	28.70	.000
	1	2,900	53.72	
DIVSTOP	0	17,486	32.57	.196
	1	776	34.79	

Panel B: Continuous and Ordinal Variables[c]

Variable	Sample	Obs.	Mean	Std. Dev.	Median
ROA	Full Sample	18,192	−0.206	0.466	−0.082
	No Reversal	11,562	−0.259	0.540	−0.116
	Reversal	5,966	−0.097***	0.215	−0.044***
PAST_ROA	Full Sample	17,162	−0.439	1.231	−0.045
	No Reversal	11,562	−0.615	1.405	−0.138
	Reversal	5,600	−0.076***	0.607	0.058***
CFO	Full Sample	16,627	−0.682	4.967	−0.029
	No Reversal	11,265	−0.988	6.035	−0.055
	Reversal	5,362	−0.039*	0.578	0.008***
ACC	Full Sample	16,627	−0.130	4.258	−0.074
	No Reversal	11,265	−0.155	5.166	−0.074
	Reversal	5,362	−0.078*	0.305	−0.074
PAST_CFO	Full Sample	14,416	−0.197	1.156	0.097
	No Reversal	9,547	−0.355	1.333	0.023
	Reversal	4,869	0.113***	0.571	0.198***
PAST_ACC	Full Sample	14,416	−0.206	0.467	−0.191
	No Reversal	9,547	−0.219	0.524	−0.197
	Reversal	4,869	−0.182***	0.327	0.179***
SIZE	Full Sample	18,026	3.218	1.897	3.055
	No Reversal	12,133	3.058	1.804	2.923
	Reversal	5,893	3.550***	2.031	3.348***
SALESGROWTH	Full Sample	17,868	0.613	3.311	−0.021
	No Reversal	11,940	0.456	9.179	−0.031
	Reversal	6,399	0.930	5.600	−0.004***
LOSS_SEQ	Full Sample	18,274	2.440	1.754	2.000
	No Reversal	12,304	2.763	1.753	3.000
	Reversal	5,970	1.775***	1.560	1.000***

***, **, * Indicate the difference between the No Reversal and Reversal subsample means or medians is significant at the 1 percent, 5 percent, or 10 percent levels, respectively.

[a] The data are collected from Compustat's Industrial and Research Annual Data Bases and cover the period 1971–2000. Losses are based on IB, defined as income (loss) before extraordinary items and discontinued operations (annual Compustat data item #18).

[b] *FIRSTLOSS* is an indicator variable equal to 1 if the current year's loss is the first in a sequence (i.e., the firm was profitable last year), and 0 otherwise; *DIVDUM* is an indicator variable equal to 1 if the firm is paying dividends (annual Compustat data item #21), and 0 otherwise; *DIVSTOP* is an indicator variable equal to 1 if the firm stopped paying dividends in the current year, and 0 otherwise.

(*continued on next page*)

TABLE 2 (continued)

[c] *ROA* is return-on-assets and calculated as income before extraordinary items (annual Compustat data item #18) scaled by lagged total assets (annual Compustat data item #6). *PAST_ROA* is average *ROA* over the past five years (i.e., $t-5$ through $t-1$); *CFO* is cash flow from operations scaled by lagged total assets, where CFO is net income (annual Compustat data item #172) − accruals *ACC*; *ACC* is ΔCurrent Assets (data item #4) − ΔCash (data item #1) − ΔCurrent Liabilities (data item #5) + ΔDebt in Current Liabilities (data item #34) + Depreciation and Amortizations (data item #14), scaled by lagged total assets. *PAST_CFO* and *PAST_ACC* are average *CFO* and *ACC* over the past five years (i.e., $t-5$ through $t-1$); *SIZE* is log of current market value (annual Compustat data item #199 * annual Compustat data item #25). *SALESGROWTH* is percentage growth in sales (annual Compustat data item #12) over the current year; *LOSS_SEQ* is an ordinal variable that counts the number of sequential losses over the past five years before the current loss.

ROA and *PAST_ROA* as profitability variables; in the second (Specification II), we decompose *ROA* into its cash flow and accrual components. We observe for Specification I that all variables, except *PAST_ROA* and *SALESGROWTH*, have statistically significant coefficients in the predicted direction. Firms with relatively higher current profitability, firms reporting a first loss or having a shorter loss sequence, larger firms, dividend-paying firms, and firms that continue to pay dividends all exhibit a higher probability of loss reversal. In unreported analysis, we find that *PAST_ROA* becomes highly significant when we exclude the loss history variables. In other words, the (binary) *FIRSTLOSS* and (ordinal) *LOSS_SEQ* variables appear to capture the information contained in the (continuous) *PAST_ROA* variable.

The results for Specification II are very similar to those for Specification I. The key difference is that both contemporaneous *CFO* and *ACC* exhibit significantly positive coefficients and that the coefficient on *SALESGROWTH* becomes significant. As in Specification I, the coefficients for the variables capturing past performance are not significant when we include loss history variables. Table 3 also shows the within-sample performance of both specifications to be very similar, although the sample sizes are different: the average p-value of the likelihood ratio statistic of the models is 0.001, and both models produce the same percentage of concordant pair classifications.

Using the annual estimated coefficients from Table 3, we compute predicted probabilities of loss reversal from each specification. Specifically, we average the annual Equation (1) coefficients over consecutive five-year panels to compute predicted reversal probabilities. We follow this methodology to mimic the process we assume investors use to assess *ex ante* loss reversal probabilities, and assume investors consider a number of years of information to assess the predicted probabilities in any given year. As an example, we average the annual coefficients of 1976 through 1980 to obtain predicted reversal probabilities for losses occurring in 1981. Using this methodology, we ensure that we use only information available at the time of the analysis to estimate the *ex ante* estimates of reversal probabilities. As before, we repeat this procedure using successive panels of data, each time dropping the oldest year and adding a new year, until we reach the end of the sample period.

Using the annual quartiles of the distribution of the predicted reversal probabilities, we classify the loss observations into samples of persistent and transitory losses.[15] We define persistent (transitory) losses as those with probabilities in the first (fourth) quartile of the distribution: persistent losses are those least likely to reverse, and transitory losses are those

---

[15] The average of the annual cut-off values of predicted reversal probabilities that determine the persistent and transitory subsamples are 0.233 and 0.446, respectively.

TABLE 3
Logistic Regression Models of Loss Reversal[a]

Variable	Predicted Sign	Specification I Coeff. (t-stat)	Specification II Coeff. (t-stat)
ROA	+	2.321 (8.331)	—
PAST_ROA	+	0.166 (0.730)	—
CFO	+	—	1.284 (5.130)
ACC	+	—	1.283 (3.453)
PAST_CFO	+	—	0.174 (1.102)
PAST_ACC	+	—	−0.189 (−1.222)
SIZE	+	0.074 (3.258)	0.069 (3.149)
SALESGROWTH	?	0.126 (1.058)	0.217 (2.156)
FIRSTLOSS	+	0.125 (1.866)	0.124 (1.874)
LOSS_SEQ	−	−0.128 (−3.493)	−0.183 (−4.668)
DIVDUM	+	0.280 (4.044)	0.287 (3.623)
DIVSTOP	−	−0.251 (−2.218)	−0.195 (−1.906)
Average Number of Annual Observations		662	556
Average LR p-value		0.001	0.001
Average % Concordance		69%	69%

[a] The table presents the results of the annual estimation of logistic regressions where the dependent variable that takes the value of 1 if the firm becomes profitable one-year into the future, and 0 otherwise.
Definitions of the variable are provided in the notes to Table 2.
Reported coefficients are the average coefficient over the estimation period (1971–2000) and associated t-statistic derived using the Fama and MacBeth (1973) procedure. The table further reports the average number of observations used in the estimations, the average p-value of the Likelihood Ratio Statistic (LR) of the models and the average percent concordant pairs, i.e., the within-sample percentage of observations correctly classified by the model.

most likely to reverse.[16] Table 4 presents descriptive information on the predicted reversal probabilities of the models reported in Table 3 for the samples of persistent and transitory losses. Panel A shows that both models provide a sharp contrast between persistent and transitory losses: persistent losses have an estimated reversal probability of about 15 percent, while transitory losses exhibit a reversal probability of slightly more than 50 percent, regardless of specification.

---

[16] Our approach differs from Chambers (1996) who relies on perfect foresight of both the number and magnitude of incurred losses to construct his measure of persistence for first-time losses.

TABLE 4
Predicted Reversal Probabilities: Descriptive Statistics

Panel A: Predicted Reversal Probabilities[a]

Sample[b]		Specification I	Specification II
Persistent	No. Obs.	3,796	3,135
	Mean	0.148	0.166
	Median	0.151	0.172
	St. Dev.	0.086	0.085
Transitory	No. Obs.	3,784	3,121
	Mean	0.530	0.538
	Median	0.517	0.519
	St. Dev.	0.074	0.086

Panel B: Time-Series Evidence: Predicted Reversal Trend[c]

Sample[b]	Specification I Coeff. (t-stat)	Specification II Coeff. (t-stat)
Persistent	−0.013	−0.012
	(−20.161)	(−21.271)
Transitory	−0.000	−0.001
	(−0.100)	(−0.302)

Panel C: Out-of-Sample Classification Accuracy[d]

Sample[b]	Specification I Mean (Median)	Specification II Mean (Median)
Persistent	83%	82%
	(83%)	(81%)
Transitory	51%	49%
	(52%)	(51%)

---

[a] Panel A shows the predicted probabilities of loss reversal using the models estimated in Table 3. We average the annual Equation (1) coefficients over consecutive five-year panels to compute predicted reversal probabilities. As an example, we average the annual coefficients of 1976 through 1980 to obtain predicted reversal probabilities for losses occurring in 1981. We repeat this procedure using successive panels of data, each time dropping the oldest year and adding a new year, until we reach the end of the sample period.

[b] We define two samples of losses based on the distribution of the predicted reversal probabilities. We sort the loss observations annually into quartiles based on their estimated probability of reversal and define persistent (transitory) losses as those with probabilities in the first (fourth) quartile of the distribution: persistent losses are therefore those least likely to reverse, and transitory losses those most likely to reverse.

[c] Panel B of the table shows the coefficients and associated t-statistics of the following regression:

$$Median_t = a + b\,year_t + error_t$$

where *Median* is the median annual predicted reversal probability in Panel A and *year* is a year-indicator variable.

[d] Panel C reports the results of a test of the classification accuracy of the predicted reversal probabilities *out-of-sample*. We use the *ex post* sample proportion of reversals versus non-reversals as a benchmark.

Panel B of Table 4 presents evidence on the time-series trend of the average annual reversal probability. The panel reports the coefficients and t-statistics of regressions of median annual reversal probabilities on year-indicator variables. We find that, while the median predicted reversal probability decreases in the persistent loss sample over the sample period, the median in the transitory group remains unchanged. In unreported analysis, we examine the time-series properties of the coefficients in the model and observe that most coefficients in Specifications I and II remain unchanged over the sample period, the exceptions being an increase in the coefficient on *DIVDUM* and a decrease in the coefficient on *SALESGROWTH*. That is, the signaling value of dividend payments for loss firms increases over the sample period (see also, Joos and Plesko 2004; Skinner 2004). By contrast, the effect of an increase in sales growth on the predicted probability of reversal decreases over the sample period.

In Panel C of Table 4, we evaluate the *out-of-sample* classification accuracy of the specifications using the sample proportion of *ex post* reversals as a benchmark.[17] Specification I of the model correctly classifies 83 percent (median = 83 percent) of observations in the persistent sample, and 51 percent (median = 52 percent) in the transitory sample.[18] The results for Specification II are similar, albeit lower. Given the similar performance of both specifications of Equation (1), we report results based on Specification I in the remainder of the paper, since it is the more parsimonious model of the two and provides a larger sample size.[19]

Overall, Table 4 shows that the reversal models allow us to define two groups of loss observations that exhibit distinct patterns of reversal probabilities over the sample period. We see in particular that persistent losses become more persistent over time. This pattern, together with the observed increase in loss frequency shown in Figure 1 and Table 1, suggests that the nature of losses changes over our sample period.

IV. THE VALUATION OF LOSSES: EARNINGS RESPONSE COEFFICIENTS

The results of the previous section show that a parsimonious model can assess the persistence of a firm's loss. In this section we test whether investors price losses as a function of their expected persistence. Our pricing analysis extends the work of Hayn (1995), who considers the role of the abandonment option for the value-implications of losses. In her analysis, Hayn (1995) uses two proxies for the future prospects of the firm (bond ratings and a liquidation value) to test how the option affects valuations, and concludes that the market reaction to a loss is greater when abandonment is less likely. Our model of loss reversal captures a particular way for investors to structure financial information to assess the persistence of a loss or, alternatively, the likelihood of abandoning their investment in the firm.

To explore the pricing of losses, we estimate ERCs in the persistent and transitory loss samples using the following regression (see also, Hayn 1995):

$$RET_t = \alpha + \beta\, IB_t + \varepsilon_{t2} \qquad (2)$$

where RET_t is the return over the 12-month period commencing with the fourth month of fiscal year t: IB_t is the earnings per share variable in year t (annual Compustat data item #18 scaled by annual Compustat data item #25) scaled by P_{t-1} or share price (annual

---

[17] For example, to verify the accuracy of the predicted probabilities of losses occurring in 1981, we use the proportion of 1981 losses that reverse in 1982 as the benchmark for the predicted reversal probabilities to classify losses into a reversal and non-reversal group.

[18] The results suggest our model misclassifies a large number of persistent loss firms into the transitory loss group. This misclassification creates a bias against finding distinct results in the valuation analyses across both groups since the presence of persistent loss observations in the transitory loss group will bias the results in the transitory group towards the results in the persistent group.

[19] We re-estimated all the analyses using the coefficients from Specification II of Equation (1) and found the results to be qualitatively similar.

Compustat data item #199) at the end of year $t-1$; and ε_{t2} is the error term. Consistent with our annual estimation of the loss-reversal model, we estimate Equation (2) in each year of the sample period and assess the significance of the ERCs using the Fama and MacBeth (1973) procedure. We predict that, if the persistent loss group consists of observations with a high likelihood of exercising the abandonment option, then the ERC in this group will be insignificantly different from zero; if the transitory loss group consists of observations with a low likelihood of exercising the abandonment option, then the ERC in this group will be positive and significantly different from zero.

Table 5 presents the results of the ERC analysis. Panel A shows that mean and median *IB* are lower in the persistent loss sample than in the transitory loss sample, with all means and medians negative by construction. However, median *IB* increases over time in the persistent loss sample, but not in the transitory loss sample. So, although persistent losses become more persistent over time (see Panel B of Table 4), they also become less negative, a result we explore further below. Panel A also shows that returns (*RET*) follow a pattern different from *IB* across the samples: surprisingly mean annual returns are *positive* in the persistent loss sample (0.193), but negative in the transitory sample (−0.050). However, median returns of persistent loss firms are more negative than median returns of transitory losses (−0.196 versus −0.162), consistent with extreme observations influencing the return distributions. The time-series evidence shows no change in median returns over time in either subsample.

Panel B reports the results of the Fama and MacBeth (1973) estimations of the ERCs. We estimate Equation (2) using both the raw *IB* and *RET* data and the ranks of observations to avoid the potential influence of the extreme *IB* and *RET* observations in the sample. Focusing on the raw data results, we find a *negative* and statistically significant ERC in the persistent sample; by contrast, the ERC in the transitory sample is positive and significant (at the 5 percent level in a one-sided test), as predicted. These findings are consistent with the patterns of the means of *IB* and *RET* in Panel A: *on average* earnings and returns have opposite signs in the persistent sample but the same sign in the transitory sample. The intercepts in the different samples reflect the sign of average returns in each sample, but are never significant.

The results of the rank regressions show that extreme observations influence the pattern of ERCs. In the persistent sample the rank ERC is insignificant, suggesting that while investors penalize losses (i.e., median returns are negative), they do not associate the penalty with the magnitude of the reported loss. In the transitory sample, the result becomes stronger when we use ranks: the ERC is positive and highly significant, consistent with earnings and returns reflecting similar information about the performance of the firm (i.e., the larger the loss, the more negative the return).

In Panel C of Table 5 we test the annual ERCs for a time-series trend over the sample period. We report the results using the rank data since Panel B reveals that extreme observations (for returns especially) influence the estimations.[20] Panel C shows that *only* the ERCs in the persistent sample decrease over time; in the transitory sample annual ERCs exhibit no change over the sample period. The results in Panel C, therefore, mirror the findings in Panel B of Table 4 in showing that *only* persistent losses become more persistent over time. We verify (in untabulated analysis) that the annual ERC in the persistent sample becomes negative and statistically different from zero (−0.096, t-statistic = −2.723) during the last ten years of the sample period (i.e., the 1990s). In other words, during the 1990s,

---

[20] We carry out all ERC analysis using the raw data and obtain qualitatively similar results to the ones reported in the text.

TABLE 5
Earnings Response Coefficient Analysis[a]

Panel A: Descriptive Statistics[b]

			Cross-Sectional Results[d]			Time-Series Evidence[e]	
Variable	**Sample[c]**	**No. Obs.**	**Mean**	**St. Dev.**	**Median**	**Coeff.**	**t-stat**
IB	Persistent	3,796	−0.371	0.402	−0.225	0.006	2.770***
	Transitory	3,784	−0.087***	0.133	−0.048***	0.000	0.312
RET	Persistent	3,796	0.193	1.401	−0.196	0.013	1.002
	Transitory	3,784	−0.050***	0.646	−0.162**	−0.006	−1.133

Panel B: Earnings Response Coefficients[f]

		Raw Data			Rank Regression	
Sample[c]	**Average No. Obs.**	**Intcpt (t-stat)**	**ERC (t-stat)**	**Adj. R^2**	**ERC (t-stat)**	**Adj. R^2**
Persistent	188	0.080 (0.656)	−0.181 (−2.793)	0.006	−0.017 (−0.491)	0.007
Transitory	187	−0.037 (−0.938)	0.166 (1.672)	0.007	0.081 (3.773)	0.004

Panel C: Rank Regression: Coefficient Time-Series Evidence[g]

Sample[c]	**Coefficient**	**t-statistic**
Persistent	−0.017	−2.892
Transitory	−0.005	−1.071

---

[a] The data are collected from Compustat's Industrial and Research Annual Data Bases and cover the period 1971–2000. Losses are based on *IB*, defined as income (loss) before extraordinary items and discontinued operations (annual Compustat data item #18).

[b] Panel A shows descriptive statistics of the variables included in the ERC regressions. RET_t is the return over the 12-month period commencing with the fourth month of fiscal year t, IB_t is the earnings per share variable in year t (annual Compustat data item #18 scaled by annual Compustat data item #25) scaled by P_{t-1} or share price (annual Compustat data item #199) at the end of year $t-1$. ***, **, * Indicate the difference between the persistent and transitory sample means or medians is significant at the 1 percent, 5 percent, or 10 percent levels, respectively.

[c] We define two samples of losses based on the distribution of the predicted reversal probabilities. We sort the loss observations annually into quartiles based on their estimated probability of reversal and define persistent (transitory) losses as those with probabilities in the first (fourth) quartile of the distribution: persistent losses are therefore those least likely to reverse, and transitory losses those most likely to reverse.

[d] ***, **, * Indicate the difference between the persistent and transitory sample means or medians is significant at the 1 percent, 5 percent, or 10 percent levels, respectively, in the cross-section.

[e] The time-series evidence shows the coefficients and associated t-statistics of the following regression:

$$Median_t = a + b\,year_t + error_t$$

where *Median* is the cross-sectional annual medians per group and *year* is a year-indicator variable.

[f] Panel B reports the results of the estimation of the following regression:

$$RET_t = \alpha + \beta\, IB_t + \epsilon_{t2}. \qquad (2)$$

We estimate Equation (2) in each year of the sample period and assess the significance of the ERCs using the Fama and MacBeth (1973) procedure. The panel shows the results of the estimation of Equation (2) using the raw data and using rank data.

[g] Panel C shows the coefficient and associated t-statistics of the following regressions:

$$Coeff_t = a + b\,year_t + error_t$$

where *Coeff* is the annual ERCs obtained using rank regressions in Panel B and *year* is a year-indicator variable.

earnings and returns started to reflect the performance of persistent loss firms differently, a pattern we do not observe in the transitory loss subsample.

Summarizing, the ERC results show that market returns reflect the information in transitory losses. This result is consistent with our prediction and corroborates Hayn's (1995) argument for a more pronounced pricing effect of a loss when investors are least likely to consider the abandonment option. We also find that investors do not change their valuation of transitory losses over time. By contrast, while we predict and find that the average ERC in the persistent group is not significantly different from zero, we also observe a decline in annual ERCs of persistent losses over time. Specifically, the ERCs in the persistent group become significantly negative, a trend that coincides with our earlier finding showing persistent losses becoming increasingly persistent. The evidence therefore suggests that investors' valuation of persistent losses has become inconsistent with the prediction of the abandonment option hypothesis, warranting further investigation in the next section.

V. THE VALUATION OF PERSISTENT LOSSES: FURTHER ANALYSES

Investors appear to change their valuation of persistent losses over time, becoming increasingly inconsistent with the prediction of the abandonment option hypothesis. We examine this finding by carrying out additional analyses focusing on different components of reported losses.[21] Specifically, we build on Givoly and Hayn (2000) and start with an analysis of the cash flow and accruals components of persistent and transitory losses.[22] Panel A of Table 6 shows that the sharpest contrast between persistent and transitory losses relates to the cash flow component: persistent losses exhibit large *negative* mean and median cash flow components, while transitory losses show *positive* mean and median cash flow components. Additionally, the accruals component of both types of losses is negative. The time-series analysis shows that the median cash flow component of persistent losses becomes significantly *more* negative over the sample period, while their median accruals component becomes *less* negative. By contrast, the time-series analysis shows the relative magnitudes of the components do not change for transitory losses.

The finding that persistent losses contain a relatively larger negative cash flow component than transitory losses is not surprising, given Sloan's (1996) finding that the cash flow component of earnings is more persistent than the accruals component. The evidence showing less negative accruals and more negative cash flows for persistent losses over time also corroborates the Sloan (1996) explanation by suggesting that their increasingly negative cash flows component leads persistent losses to become *more* persistent (see Panel B of Table 4). However, Sloan's (1996) result does not explain why the ERC for persistent losses becomes negative as their cash flow component becomes more negative. We therefore examine in greater detail the cash flow component of persistent and transitory losses. Specifically, we focus on the R&D component of losses because recent research (e.g., Amir and Lev 1996; Collins et al. 1997; Lev and Zarowin 1999) finds that the relative magnitude of R&D expenditures—expensed under U.S. GAAP and reported as part of the cash flow from operations—increases significantly over the past decades, influencing the properties of reported accounting measures.

---

[21] To be consistent with the preceding pricing analysis, we define all variables per share and scale by lagged price. We repeat the descriptive analysis using sales and lagged assets as scalars and find qualitatively similar results.

[22] As a reminder, we classify observations into the persistent and transitory samples based on the *ex ante* loss reversal probability from a model that uses information in aggregate *ROA* (i.e., Specification I in Table 4), and not its *CFO* and *ACC* components. This eliminates the possibility the results could follow mechanically from our initial classification method.

TABLE 6
Persistent and Transitory Losses: Components Analysis[a]

			Cross-Sectional Results			Time-Series Evidence[d]	
Variable	**Sample[c]**	**No. Obs.**	**Mean**	**St. Dev.**	**Median**	**Coeff.**	**t-stat**
Panel A: Descriptive Statistics: Cash Flows and Accruals[b]							
CFO	Persistent	3,683	−0.175	0.481	−0.114	−0.007	−4.123
	Transitory	3,322	0.056***	0.272	0.032***	−0.001	−1.362
ACC	Persistent	3,683	−0.176	0.482	−0.048	0.011	5.130
	Transitory	3,322	−0.140***	0.285	−0.096***	0.001	0.092
Panel B: Descriptive Statistics: R&D Component[e]							
R&D	Persistent	3,675	−0.072	0.132	−0.022	−0.004	−8.182
	Transitory	3,573	−0.032***	0.064	0.000***	NA	NA
IB − R&D	Persistent	3,675	−0.296	0.397	−0.151	0.008	4.232
	Transitory	3,573	−0.055***	0.149	−0.029***	0.000	0.440

***, **, * Indicate the difference between the persistent and transitory sample means or medians is significant at the 1 percent, 5 percent, or 10 percent levels, respectively, in the cross-section.

[a] The data are collected from Compustat's Industrial and Research Annual Data Bases and cover the period 1971–2000. Losses are based on *IB*, defined as income (loss) before extraordinary items and discontinued operations (annual Compustat data item #18).

[b] Panel A shows descriptive statistics for the *CFO* and *ACC* component variables. *CFO* is cash flow from operations or net income (annual Compustat data item #172) − *ACC*; *ACC* is ΔCurrent Assets (data item #4) − ΔCash (data item #1) − ΔCurrent Liabilities (data item #5) + ΔDebt in Current Liabilities (data item #34) + Depreciation and Amortizations (data item #14).

[c] We define two samples of losses based on the distribution of the predicted reversal probabilities. We sort the loss observations annually into quartiles based on their estimated probability of reversal and define persistent (transitory) losses as those with probabilities in the first (fourth) quartile of the distribution: persistent losses are therefore those least likely to reverse, and transitory losses those most likely to reverse.

[d] The time-series evidence shows shows the coefficients and associated t-statistics of the following regression:

$$Median_t = a + b\,year_t + error_t$$

where *Median* is the cross-sectional annual medians per group and *year* is a year-indicator variable.

[e] Panel B shows descriptive statistics for the *R&D* and *IB − R&D* component variables. *R&D* is research and development expenditure per share or annual Compustat data item #46 scaled by annual Compustat data item #25. All variables are scaled by lagged price (annual Compustat data item #199).

We define *R&D* as annual Compustat data item #46 (per share and scaled by lagged price or data item #199) and observe significant differences in the frequency and relative magnitude of *R&D* between the persistent and transitory loss samples in Panel B of Table 6. More than half of persistent losses contain an R&D component; additionally, the average magnitude of *R&D* outlays is twice as large in the persistent loss group than in the transitory loss group. Further, earnings *without* the R&D component, or *IB − R&D*, are considerably lower for persistent loss firms than for transitory loss firms. Time-series analysis of the medians of R&D outlays further show that over the sample period the R&D outlays of persistent loss firms have become significantly larger, consistent with the descriptive patterns of other studies (see above); by contrast, the median R&D outlay of transitory losses has not changed and remained zero over the sample period. Additionally, the time-series evidence shows *IB − R&D* becoming less negative for persistent losses and not changing for transitory losses.

Summarizing, the descriptive analysis suggests that the growing presence of a large negative cash flow, and in particular a large and increasing R&D component, in persistent losses is a key difference between the persistent and transitory losses; it also coincides with persistent losses becoming both more persistent and less negative over time. Importantly, the growing R&D presence in persistent losses coincides with the negative pricing of persistent losses in the later years of our sample period. Therefore, based on the descriptive evidence, we hypothesize the presence of a growing R&D component in persistent losses explains the changing and seemingly anomalous pricing of persistent losses over the sample period.

To investigate this hypothesis, we parse the persistent loss observations into two subgroups based on whether they contain R&D expenditures and predict investors will value persistent losses differently across the subgroups.[23] We hypothesize that losses in the first subgroup, i.e., persistent losses without an R&D component (No R&D group), indicate a firm is in distress; that is, the persistence of the loss indicates a high likelihood of exercising the abandonment option. Consistent with the abandonment option hypothesis, we predict that investors will *not* respond to the magnitude of the loss in this subgroup of persistent losses.

The second subgroup consists of persistent losses with an R&D component: this subgroup consists of firms that make long-term investments in R&D that contribute to persistent losses, since under U.S. GAAP firms expense R&D investments. We conjecture that in this subgroup the *aggregate* loss is not a good indicator that the firm is in distress. Instead, we predict investors will understand the different valuation implications of the R&D and non-R&D components of the losses and price them separately. Specifically, we predict investors will value the R&D component as an asset, acknowledging its future earning potential. Given our coding of R&D expenditures as outlays (i.e., with a negative sign), we expect a negative coefficient on *R&D*. Additionally, we predict investors will value the non-R&D component of the loss *as if* it constitutes a transitory loss for two reasons. First, if investors acknowledge the R&D expenditures' future earning potential, they will not interpret the negative non-R&D component as an indicator of a high likelihood of abandonment. Second, investors understand that the GAAP treatment of R&D expenditures by itself contributes to the persistence of the losses. Consistent with the abandonment option hypothesis, we predict the coefficient on the non-R&D component will be positive, similar to the results in the transitory loss sample (see Panel B of Table 5).

We present the results of our analysis in Table 7. Panel A provides descriptive statistics for the variables of interest.[24] Focusing on the medians—all distributions are heavily skewed—we find that the No R&D observations exhibit significantly worse performance in terms of $IB - R\&D$ and RET than the R&D observations, consistent with our hypothesis that No R&D persistent losses are a stronger indication the firm is in distress.

Panel B of Table 7 presents the pricing results based on rank regressions in the subgroups. To test our hypothesis, we estimate Equation (3) using the Fama and MacBeth (1973) methodology in each of the subgroups:

$$RET_t = \alpha + \beta(IB_t - R\&D_t) + \gamma\, R\&D_t + \varepsilon_{t3}. \tag{3}$$

All variables are as defined before, and ε_{t3} is an error term.

---

[23] We thank a referee for suggesting this analysis.

[24] As before in Table 6, we define all variables in this table per share and scale by lagged price to be consistent with the definition of returns.

TABLE 7
Valuation of Persistent Losses as a Function of R&D Intensity[a]

Panel A: Descriptive Statistics[b]

Variable	Sample[c]	No. Obs.	Mean	Std. Dev.	Median
IB – R&D	No R&D	1,352	−0.480	0.468	−0.324
	R&D	2,323	−0.189***	0.302	−0.086***
R&D	No R&D	1,352	NA	NA	NA
	R&D	2,323	−0.114	0.150	−0.067
RET	No R&D	1,352	0.126	1.209	−0.199
	R&D	2,323	0.246***	1.536	−0.187***

Panel B: Rank Regression on Persistent Loss Components[d]

		Variables	
Sample[c]	Avg. No. Obs.	*IB – R&D* Coeff. (t-stat)	*R&D* Coeff. (t-stat)
No R&D	68	−0.066 (−0.836)	NA
R&D	128	0.111 (3.685)	−0.369 (−8.053)

***, **, * indicate the difference between the High R&D and the Low R&D group means or medians is significant at the 1 percent, 5 percent, or 10 percent levels, respectively.

[a] The data are collected from Compustat's Industrial and Research Annual Data Bases and cover the period 1971–2000. We define two samples of losses based on the distribution of the predicted reversal probabilities. We sort the loss observations annually into quartiles based on their estimated probability of reversal and define persistent (transitory) losses as those with probabilities in the first (fourth) quartile of the distribution: persistent losses are therefore those least likely to reverse, and transitory losses those most likely to reverse.

[b] Panel A shows descriptive statistics for the following variables: *R&D* is research and development expenditure per share or annual Compustat data item #46 scaled by annual Compustat data item #25; *IB – R&D* is *IB* or earnings per share variable (annual Compustat data item #18 scaled by annual Compustat data item #25) – *R&D*; *RET* is the return over the 12-month period commencing with the fourth month of fiscal year *t*. All variables are scaled by lagged price (annual Compustat data item #199).

[c] The No R&D (R&D) group contains the persistent loss observations *without* (with) R&D component.

[d] Panel B reports the results of the estimation of the following rank regression:

$$RET_t = \alpha + \beta(IB_t - R\&D_t) + \gamma R\&D_t + \varepsilon_{t3}. \tag{3}$$

We estimate Equation (3) in each year of the sample period and assess the significance of the ERCs using the Fama and MacBeth (1973) procedure.

The result in the No R&D subgroup is as predicted: investors do not price *IB – R&D* (or *IB*, since *R&D* is zero in this group), consistent with the persistence of the loss indicating a high likelihood of exercising of the abandonment option. In the R&D subgroup, investors price *both* components as predicted: the coefficient on *IB – R&D* is positive and significant, consistent with investors pricing it as a transitory loss, and the coefficient on *R&D* is negative and significant, consistent with investors pricing R&D as an asset. Our decomposition analysis therefore emphasizes that persistent losses consist of two subgroups and explains why our initial results for *aggregate* persistent losses appear to be at odds with the abandonment option hypothesis. The analysis further highlights the central role of the increasingly large R&D component in the valuation of persistent losses.

VI. ADDITIONAL ANALYSES: THE VALUATION OF CASH FLOWS AND ACCRUALS

The analyses in the previous section show that the valuation role of R&D is key to understanding why investors appear to price persistent losses in a manner inconsistent with the abandonment option hypothesis. However, the descriptive evidence in Panel A of Table 6, showing large and changing differences between the relative magnitudes of the cash flows and accruals components of persistent and transitory losses, raises the additional question of how investors price these aggregate components in each sample. We therefore complement the analyses of the previous section with a discussion of untabulated analyses of how investors price the cash flow and accrual components as a function of the estimated loss persistence.

For persistent losses, we find that, while investors do not price the cash flow component, they value the accruals component positively (coefficient = 0.080, t-statistic = 3.206). However, when we differentiate (as before) between persistent losses with and without an R&D component, we find that, in the R&D group, the coefficient on the cash flow component is negative and significant (−0.087 with a t-statistic = −1.917), while the coefficient on the accruals component remains positive and significant (0.118 with a t-statistic = 4.032). Further analysis that separates cash flows into their R&D and non-R&D component shows that investors' valuation of the R&D component leads to the negative valuation coefficient on cash flows in this group, since we observe that investors do not price the non-R&D component of cash flows. By contrast, in the No R&D group, we find that investors price *neither* loss component, a result consistent with our finding in Table 7 that investors do not price aggregate earnings in this group. Our analysis therefore shows that investors look beyond aggregate cash flows to value persistent losses, emphasizing the importance of R&D for their valuation.

For transitory losses, we observe a positive and significant coefficient on the cash flow component (coefficient = 0.137, t-statistic = 4.265), and a statistically insignificant coefficient on the accruals component. In other words, while investors appear to identify and price the (positive) cash flow component (see Panel A of Table 6) of transitory losses, they do not appear to price the negative accruals, *as if* they consider the accruals to be transitory.

Taken together, the analyses show that investors price the aggregate cash flow and accruals components of losses differently as a function of the estimated persistence of the losses. These results also reinforce our earlier findings on the pricing of persistent and transitory losses and on the role of the R&D component in the pricing of persistent losses.

VII. CONCLUDING REMARKS

Our research addresses the problem of valuing firms that report negative earnings. Building on Hayn (1995), we hypothesize that investors value a loss differently as a function of the expected likelihood of exercising the abandonment option. We develop a proxy for the likelihood of exercising the abandonment option based on a model of loss reversal, where we assume the probability of reversal relates inversely to the likelihood of exercising the abandonment option. We show that a parsimonious model of one-year-ahead loss reversal using information on the financial profile of the firm, its loss sequence, and its dividend policy is useful in predicting the firm's return to profitability.

We use the estimated probabilities of loss reversal as a proxy for *ex ante* loss persistence to construct samples of persistent and transitory losses and test whether the valuation of different types of losses varies as a function of their expected probability of reversal. Our results show that investors respond positively to the magnitude of transitory losses, consistent with the notion that the *ex ante* estimate of persistence of transitory losses is a good proxy for a low likelihood of exercising the abandonment option. In addition, investors' valuation of transitory losses does not change over the sample period. By contrast, while we find that investors on average do not value persistent losses, we also document a change in the valuation of persistent losses over time. Specifically, we find that over time larger persistent losses correspond to higher returns. In other words, over the sample period, investors' valuation of persistent losses becomes inconsistent with the prediction of the abandonment option hypothesis.

To understand why investors appear to change their valuation of persistent losses, we study the components of persistent losses and establish the key role of R&D for their valuation. We find that investors do *not* respond to the magnitude of persistent losses when they contain no R&D component, consistent with these losses indicating financial distress and a high likelihood of exercising the abandonment option. When pricing persistent losses with an R&D component, investors value the R&D component as an asset and value the non-R&D component *as if* it is a transitory loss, again consistent with the abandonment option hypothesis.

Overall, our results confirm and extend Hayn's (1995) findings on the abandonment option for the pricing of losses. In assessing whether a loss is a good indicator of the likelihood of exercising the abandonment option, investors consider information beyond aggregate earnings, cash flows, and accruals. The results show that investors do not consider losses to be homogeneous, but consider the causes and nature of the loss to assess its long-term implications for firm value. Notably, we find investors acknowledge the key role of R&D expenditures for the valuation of (persistent) losses.

REFERENCES

Altman, E. 1968. Financial ratios, discriminant analysis and the prediction of corporate bankruptcy. *Journal of Finance* 22: 589–610.

Amir, E., and B. Lev. 1996. Value-relevance of nonfinancial information: The wireless communications industry. *Journal of Accounting and Economics* 22: 3–30.

Berger, P. G., E. Ofek, and I. Swary. 1996. Investor valuation of the abandonment option. *Journal of Financial Economics* 42: 257–287.

Burgstahler, D., and I. Dichev. 1997. Earnings, adaptation, and firm value. *The Accounting Review* (April): 187–215.

Chambers, D. J. 1996. The information content of negative earnings and its relation with initial-loss persistence. Working paper, University of Illinois. Available at: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=15048.

Collins, D. W., E. L. Maydew, and I. S. Weiss. 1997. Changes in the value relevance of earnings and book values over the past forty years. *Journal of Accounting and Economics* 24: 39–67.

———, M. Pincus, and H. Xie. 1999. Equity valuation and negative earnings: The role of book value of equity. *The Accounting Review* (April): 29–61.

DeAngelo, H., and L. DeAngelo. 1990. Dividend policy and financial distress: An empirical investigation of troubled NYSE firms. *Journal of Finance* 45: 1415–1431.

———, ———, and D. Skinner. 1992. Dividends and losses. *Journal of Finance* 47: 1837–1863.

Fama, E., and J. MacBeth. 1973. Risk, return, and equilibrium: Empirical tests. *Journal of Political Economy* 81: 607–636.

Givoly, D., and C. Hayn. 2000. The changing time-series properties of earnings, cash flows, and accruals: Has financial reporting become more conservative? *Journal of Accounting and Economics* 29: 287–320.

Hayn, C. 1995. The information content of losses. *Journal of Accounting and Economics* 20: 125–153.

Healy, P., and K. Palepu. 1988. Earnings information conveyed by dividend initiations and omissions. *Journal of Financial Economics* 21: 149–175.

Hribar, P., and D. W. Collins. 2002. Errors in estimating accruals: Implications for empirical research. *Journal of Accounting Research* 40: 105–135.

Joos, P., and G. A. Plesko. 2004. Costly dividend signaling: The case of loss firms with negative cash flows. Working paper, MIT Sloan School of Management. Available at: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=494742

Klein, A., and C. Marquardt. 2003. Can economic factors explain the rise in accounting losses over time? Working paper, New York University. Available at: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=297934.

Lev, B., and P. Zarowin. 1999. The boundaries of financial reporting and how to extend them. *Journal of Accounting Research* 37 (Autumn): 353–385.

Modigliani F., and M. H. Miller. 1966. Some estimates of the cost of capital to the electric utility industry, 1954–57. *The American Economic Review* LVI (3): 333–391.

Piotroski, J. D. 2000. Value investing: The use of historical financial statement information to separate winners form losers. *Journal of Accounting Research* 38 (Supplement): 1–41.

Skinner, D. 2004. What do dividends tell us about earnings quality? Working paper, University of Michigan Business School. Available at: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=484542.

Sloan, R. G. 1996. Do stock prices fully reflect information in accruals and cash flows about future earnings? *The Accounting Review* 71 (3): 289–315.

Watts, R., and J. Zimmerman. 1986. *Positive Accounting Theory*. Englewood Cliffs, NJ: Prentice Hall.

———. 2003. Conservatism in accounting, Part II: Evidence and research opportunities. *Accounting Horizons* 17 (4): 287–301.

Wysocki, P. D. 2001 Real options and the informativeness of segment disclosures. Working paper, MIT. Available at: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=141044.

THE ACCOUNTING REVIEW
Vol. 80, No. 3
2005
pp. 871–895

Judging the Risk of Financial Instruments: Problems and Potential Remedies

Lisa Koonce
The University of Texas at Austin

Marlys Gascho Lipe
University of Oklahoma

Mary Lea McAnally
Texas A&M University

ABSTRACT: Information that firms provide about financial instruments and derivatives should help investors judge risk. However, this paper reports that such information often is not effective for this purpose. Through a series of experiments, we demonstrate that the labels firms use to describe financial instruments and derivatives cause investors to assess economically equivalent instruments as different in terms of risk. We also show that loss-only disclosures that companies use to describe their risks cause investors to assess the same level of risk for firms with differing underlying exposures. Moreover, we establish that loss-only disclosures cause investors to make risk judgments that correspond to infrequently used risk-management strategies. We test two possible remedies for these judgment problems. Our results show that additional information describing the underlying economic exposures of a financial instrument does not eliminate the labeling effects. However, we do find that providing investors with upside and downside (i.e., two-sided) risk disclosures help them distinguish among firms using different risk-management strategies.

Keywords: *financial instruments and derivatives; risk judgments; investor behavior.*

I. INTRODUCTION

Firms routinely provide investors with information about the firms' financial instruments and derivatives. Although this information should aid investors in judging the risk of these instruments, it is not necessarily effective in doing so. We identify two

---

We thank Urton Anderson, Leslie Hodder, Jane Kennedy, Bill Kinney, Don Moser, Fred Phillips, Mike Wilkins, Chris Wolfe, two reviewers, participants at the 2003 AAA Annual Meeting, and workshop participants at the following universities for their helpful comments: Arizona State University, Cornell University, Emory University, University of Oklahoma, University of Pittsburgh, The University of Texas at Dallas, and University of Washington. The Business Measurement and Assurance Services Center in the Department of Accounting at the University of Texas provided funding for this project.

Editor's note: This paper was accepted by Jane Kennedy, Editor.

Submitted June 2003
Accepted November 2004

commonly occurring situations that impede investors' risk judgments of financial instruments and derivatives. The first situation pertains to the variation in the labels that firms use to describe financial instruments (Peterson and Thiagarajan 2000). Because they affect how investors think about possible outcomes, labels can cause investors to judge risk *differently* for financial instruments that have *similar* underlying economic exposures. The second situation relates to risk disclosures (in financial reports) that fail to provide information sufficient to allow investors to assess the underlying risk of financial instruments and derivatives (Hodder et al. 2001; Schrand and Elliott 1998). In this situation, investors must make inferences to judge risk. In many cases, these inferences will be systematically biased and cause investors to make *similar* risk judgments for financial instruments and derivatives with *different* underlying economic exposures. In this paper, we investigate whether these types of risk-judgment problems occur. We also explore whether additional information about financial instruments and derivatives will overcome these problems.

Investigating whether and how currently available information about financial instruments and derivatives impedes risk judgment is important for at least two reasons. First, if investors are unable to judge the risk of financial instruments and derivatives based on their underlying economics, then companies holding those instruments and derivatives could be mispriced (Guay et al. 2003). Given the widespread and increasing use of financial instruments and derivatives (Bodnar et al. 1998), this potential problem could be significant. Second, investors continue to campaign for more forward-looking information about the risks and uncertainties that face corporate managers (Mayo 2002; also, see Ryan 1997), arguing that currently available information is inadequate (Buffett 2003). Although standard setters have stepped up their efforts to increase risk-relevant information in financial reports, very little research exists to help guide them in their efforts (Hodder et al. 2001).

To investigate whether investors have difficulty judging risk using currently available information and to explore whether additional risk related information will improve investors' risk judgments, we conducted four experiments. In the first two, we varied the labels that describe financial instruments and derivatives and tested whether such variation causes different risk judgments even when the underlying economic exposures are held constant. In our first experiment, investors evaluated the risk of one of three debt positions that had similar risk exposures but different labels (i.e., fixed-rate debt, variable-rate debt combined with a swap to produce a net fixed-rate position, or the latter described as a hedge). Consistent with the use of the availability heuristic, participants judge the variable-rate debt with a swap as riskier than the other two instruments despite their similar exposures. To test a potential remedy for this judgment problem, we investigated whether additional information separately describing the underlying cash-flow and fair-value exposures of each instrument would be effective at removing these labeling effects. We find that even with this additional information, investors still judge the swap as most risky. A follow-up experiment demonstrates the robustness of this labeling effect and also finds that the labels influence investment preferences.

We conducted our third and fourth experiments in the domain of FRR No. 48's market-risk financial statement disclosures (SEC 1997). FRR No. 48's sensitivity analysis format requires companies to disclose the potential downside (i.e., potential losses) associated with certain market risks, but does not require firms to disclose the potential upside (i.e., potential gains). We find that investors who read loss-only disclosures are unable to distinguish among firms with different risk-management strategies. Rather, investors with loss-only disclosures make risk judgments that correspond to risk-management strategies where potential losses exceed potential gains. Such an outcome pattern indicates the use of written options, a strategy that is infrequently used by manufacturing companies similar to the one used in our experiment. Because follow-up data collection suggests that our participant population does understand that written options are infrequently used, we conclude that investors provided with one-sided loss disclosures err in their risk judgments by failing to consider the frequencies of various risk-management strategies.

Our third experiment also demonstrates that two-sided disclosures remedy this judgment error, enabling investors to make risk judgments that discriminate among firms using different risk-management strategies. A final, follow-up experiment demonstrates the robustness of these conclusions about two-sided disclosures and also shows that two-sided disclosures can provide an additional benefit. That is, such disclosures can allow investors to correctly infer the specific derivatives companies are using. Interestingly, we find that even if investors are unable to use two-sided disclosures to discern the type of derivative strategy used by a company, these disclosures enable them to make risk judgments that mimic risk judgments of more knowledgeable investors.

We use experiments for several reasons. First, to test our ideas, it is necessary to hold constant a feature of the instrument, the underlying economics, or the information provided. For example, in our first two experiments, we hold constant the underlying economics of the financial instruments and vary labels to isolate their effect. We also isolate the labeling effect from the effect of accounting choices by setting the experiment outside of a financial reporting context. In our third experiment, we hold constant the one-sided loss disclosure information and vary the underlying economics to isolate the impact of disclosing potential gains. We would be unable to incorporate these important design features in an archival study given the variation in risk-disclosure content and company economics (Guay 1999). Second, because we are interested in the effectiveness of particular risk disclosures, using archival data that measure, for example, overall firm riskiness (e.g., beta or cost of capital metrics) could obscure the specific effects in which we are interested. Third, experiments permit us to test the efficacy of additional financial information and disclosures that currently are not provided (Libby et al. 2002).

Our study has both theoretical and practical implications. Specifically, we add to the existing theory in accounting and finance by demonstrating that investors' risk judgments are adversely affected by information characteristics previously considered innocuous. By identifying potential remedies for these risk-judgment problems, we also offer theoretical insights into how such problems may be avoided. Our study also has implications for managers and regulators. Firm managers should understand that their choice of financing (which, in turn, influences labels) can systematically affect how investors judge risk. Firm managers also should find beneficial our insights about how investors respond to the one-sided disclosures currently required by FRR No. 48. In addition, regulators should be interested in our study as our results indicate that requiring upside and downside information should improve the usefulness of disclosures about financial instruments and derivatives, but that additional information about underlying exposures is not helpful for reducing the strong effects of labels.

The remainder of the paper is organized as follows. In Section II, we use judgment and decision-making research to derive predictions for the effects of labels and one- versus two-sided disclosures for financial instruments. Section III and IV describe experiments designed to test these predictions. Implications of the results are discussed in Section V.

II. HYPOTHESIS DEVELOPMENT

In this study, we investigate how investors judge the risk of financial instruments given information that is commonly provided about them. Based on past research on risk judgments in a variety of contexts, we expect investors' risk judgments will be affected by potential negative and positive outcomes that are described in, or inferred from, this information.

Prior research finds that risk judgments in some contexts, such as medicine, are primarily determined by potential negative outcomes (Loewenstein et al. 2001; Kleinbaum et al. 1982). However, in other contexts such as those involving gambles, people assess risk based on both upside and downside potential (Weber and Bottom 1989, 1990). Common pricing models in finance also incorporate upside and downside potential to calculate a number of different statistical measures that gauge risk (Markowitz 1952, 1991; Arditti 1967; Kraus and Litzenberger 1976). In summary, the potential for negative outcomes (losses) is clearly an important factor in human risk judgments, but the potential for positive outcomes (gains) is also important in many contexts. Information regarding financial instruments typically describes or affects expectations about potential losses and gains. Consequently, we expect loss and gain information that is described in or inferred from financial instrument descriptions to affect risk judgments.

The Effect of Variation in Labels

Companies often use labels to refer to financial instruments and derivatives. Although a particular financial instrument or derivative may have a commonly used label, it is often the case that multiple labels exist for similar economic positions. Prior research concludes that labels can systematically affect judgments in ways not explained by economic analysis (Hopkins 1996; Levin et al. 1985; Simon and Hayes 1976). We expect this will occur for financial instruments and derivatives. For example, if economics alone determines investors' risk judgments, the following two positions would be judged equally risky: (1) fixed-rate debt and (2) variable-rate debt combined with a variable-to-fixed-interest-rate swap. For both of these, changes in market interest rates affect the instruments' fair value but do not affect their interest payment cash flows. That is, the economic exposure for these two positions is the same. Next, we provide some institutional detail regarding interest rates swaps and then explain why we believe the two positions described above will be judged as differentially risky despite their similar economic exposures.

An interest-rate swap is an agreement between two parties to exchange interest payments on a common notional (i.e., principal) amount (Kolb 1999). For example, when a firm with variable-rate debt enters into a variable-to-fixed-interest-rate swap, the firm receives from its counterparty (i.e., the other party to the swap contract) variable interest payments based on the notional amount. In exchange, the firm pays the counterparty the fixed interest-rate payments based on the same notional amount (in actuality, only the net amount is exchanged). Thus, this swap contract combined with the firm's own variable-rate debt creates *de facto* fixed-rate debt. That is, the firm both pays (to its lender) and receives (from the counterparty) variable-rate interest, so the variable interest cancels out and the firm is left paying fixed-rate interest (to the counterparty). Parties enter into swap contracts for a number of reasons including differing expectations about future interest rates, and which party wins or loses on the swap contract depends on the relation between the fluctuating variable rate and the unchanging fixed rate.

Because a swap contract includes an additional party as compared to fixed-rate debt, one might think that swaps are riskier because of counterparty risk (i.e., the risk that the other party will default and not make an interest payment). However, in practice, the vast majority of interest-rate swaps are brokered through swap dealers—major commercial and investment banks that guarantee payment. Consequently, swap parties need only be concerned with the financial condition of the swap dealer (Kuprianov 1994). These dealers control their risks by transacting only with firms that have credit ratings of A or higher

(Litzenberger 1992) and by requiring credit enhancements or collateral to limit their exposures. A long stream of theoretical and empirical-archival research shows that counterparty risk is negligible for most interest-rate swaps (Cooper and Mello 1991; Sorenson and Bollier 1994; Duffie and Huang 1996; Huge and Lando 1999; Bomfim 2003).[1]

Because both fixed-rate debt and variable-rate debt combined with the swap described above leave the company with *de facto* fixed-rate debt, both positions have the same economic exposures. That is, changes in interest rates will *not* affect the cash interest payments under either position, but such rate changes *will* affect the fair values of both positions equally. Despite having the same economic exposures, we predict that labeling an instrument as a *swap* will increase its perceived riskiness due to the availability heuristic. Availability involves judging the likelihood of an event by the ease of recalling or imagining instances of the event (Tversky and Kahneman 1973; Moser 1989). Prior research suggests that individuals often rely on the availability heuristic to judge risk (Folkes 1988).

We expect availability effects for losses from derivative securities, such as swaps, futures, and options due to their negative media attention. Derivative-related losses have been highly publicized, beginning with the large derivatives losses in the mid-90s including Orange County, Procter & Gamble, and Barings Bank (Loomis 1995; Holland and Glasgall 1994) to Enron in 2001 (Timmons 2001). Most recently, the derivative controversy was made salient by sharp criticism from respected business leader, Warren Buffett, who describes derivatives as "financial weapons of mass destruction" (Buffett 2003, 82) and by the increased regulatory scrutiny of derivative users (Hilzenrath 2003). These events and the related media coverage make potential losses from derivatives more readily available in the minds of investors than similar losses due to non-derivatives. In fact, some firms claim they are unwilling to use derivatives because of potential negative reaction by investors (Bodnar et al. 1998). Based on the cognitive availability of derivative losses, we predict that the swap (a derivative) will be judged as riskier than fixed-rate debt, a non-derivative instrument with the same cash-flow and fair-value exposures. We summarize this prediction below:

H1a: Variable-rate debt combined with a variable-to-fixed-interest-rate swap will be judged as riskier than fixed-rate debt.

Our second hypothesis concerns the effect of a second label, hedge, on investors' risk perceptions. We predict that including the label hedge will overcome the perceived incremental risk associated with derivatives, even though the label itself does not change the underlying economic exposures. To test this, we consider a third *de facto* fixed-rate debt position: variable-rate debt combined with a variable-to-fixed-interest-rate swap labeled as a hedge. Although this combination still includes a derivative, we posit that labeling the swap as a hedge is likely to make available thoughts associated with the notion of insurance. Schoemaker (1980) shows that individuals presented with a set of options comparing a sure versus uncertain loss make different decisions when the options are labeled insurance versus gamble. The insurance context fosters the belief that the decision maker is protected from all relevant hazards; such complete protection is highly valued by decision makers (Kahneman and Tversky 1979; Fox et al. 1996). Based on the insurance-like nature of the label hedge, we hypothesize the following:

---

[1] Because fixed-rate debt and the debt combined with derivatives that we describe differ only in counterparty risk, and this risk is negligible, we describe these three positions as economically equivalent throughout the remainder of the paper.

H1b: Variable-rate debt with a variable-to-fixed-interest-rate swap labeled as a hedge will be judged as less risky than the variable-rate debt with a variable-to-fixed-interest-rate swap (not labeled as a hedge).

It is important to note that using the term hedge to describe a financial instrument does not necessarily mean that the instrument qualifies for hedge accounting. SFAS No. 133 addresses hedge accounting and prescribes how derivatives should be measured and presented within financial reports (FASB 1998). If derivatives meet certain criteria promulgated in SFAS No. 133, a company is permitted (but not required) to use hedge accounting.[2] Importantly, SFAS No. 133 does not address when a company may or may not use the word hedge, rather, the standard only prohibits hedge accounting if the criteria are not met. In sum, the word hedge does not necessarily imply any particular accounting treatment.[3] However, to focus on the effect of the label rather than the accounting method, our experiments test the foregoing hypotheses in a context outside of firms' accounting reports.

Will Additional Exposure Information Remedy the Effect of Labels?

Normatively, there is little justification for the labeling effects we predict above; the three instruments create the same economic exposure. To determine if investors' risk judgments can be made immune to these labeling effects, we explore whether specific information about the instruments' cash-flow and fair-value exposures helps investors more appropriately assess the risk of the three financial instruments (see also Wong 2000). As noted earlier, cash-flow risk is controlled by each of the three financial instruments we study, but fair-value risk remains. Investors confronted with the swap label may consider or react to the perceived derivative-related risk due to its availability without regard for the controlled cash-flow exposure. In contrast, investors evaluating the instrument labeled a hedge may be unaware that fair-value exposure remains. Separately identifying and disclosing the fair-value and cash-flow exposures should reduce the impact of the labels by making available a more complete picture of the controlled and uncontrolled risks. Thus, we hypothesize that providing information about the fair-value and cash-flow exposures should undo the effects of labels (Levin and Gaeth 1988):

H1c: With information describing both cash-flow and fair-value exposures, investors will judge fixed-rate debt, variable-rate debt with a variable-to-fixed-interest-rate swap, and variable-rate debt with a variable-to-fixed-interest-rate swap labeled as a hedge as equally risky.

Above, we predict that investors will be inappropriately influenced by the labels associated with financial instruments and derivatives, and we propose a potential new disclosure to remedy this problem. That is, we predict that labels can cause people to judge

---

[2] To qualify for hedge accounting, the firm must have (1) a hedged item (i.e., an asset or liability or forecasted transaction), (2) a hedging instrument (i.e., a derivative instrument), (3) a risk being hedged (e.g., fair value, cash flow), and (4) evidence indicating the hedge will be highly effective (i.e., 80–125 percent effective in neutralizing the risk).

[3] Our review of actual financial reports reveals that both companies that do and do not employ hedge accounting use the word hedge within their financial reports. Companies that use hedge accounting typically employ phrases such as "qualifying for hedge accounting" in their financial reports. Companies that do not qualify for hedge accounting often use terminology like that found in Del Monte's 2004 annual report. They note that some of their derivatives are designated as "a hedging instrument whose change in fair value is recognized to act as an economic hedge but does not meet the requirements to receive hedge accounting ("Economic Hedge")."

equivalent economic positions as *different* in terms of risk. In the next section of the paper, we investigate the opposite judgment problem, namely situations where investors are likely to judge *different* economic positions as *equivalent* in terms of risk.

The Effect of One-Sided Disclosures

Companies with financial instruments and derivatives have predictable positive or negative changes in their cash flows, fair values, and/or earnings given particular changes in market prices (e.g., interest rates, commodity prices). Currently, under the SEC's FRR No. 48, firms are required to provide disclosures about the negative effects associated with potential market-price changes.[4] The most popular form of disclosure under this regulation is the sensitivity analysis format wherein firms disclose the potential loss outcome from a given hypothetical price or rate change (Roulstone 1999). For example, in its 2003 10-K filing, Maytag disclosed that it could potentially lose $3 million if interest rates increased by 1 percent during 2004.

While firms must disclose potential losses, the SEC does not require disclosure of potential gains.[5] This could be problematic because for a given market-rate change, different derivatives (i.e., futures, call options, put options) can have equal potential losses but very different potential gains. Consider the following three possible derivative strategies that a manufacturing company could use to manage price exposure on anticipated commodity purchases. The company could use futures and forward contracts, in which case the company's potential gains and losses arising from future commodity-price changes would be equal. Or, the company could buy call options, in which case potential gains would be larger than potential losses. Lastly, the company could write put options to manage its purchases, which would result in potential gains being smaller than potential losses. However, if the firm reported only the potential losses (as required by FRR No. 48), then investors would be unable to determine the type of derivative the company used.

Because they do not allow investors to identify firms' actual risk-management strategies or derivative use, one-sided disclosures provide insufficient information for investors to assess risk. Consequently, investors must make inferences about undisclosed gains. Prior research is unclear about the type of inference investors will make about the gains but does offer some suggestions. One possibility is that investors assess risk as if potential losses dominate potential gains. This possibility is consistent with research showing that people are most strongly affected by information that is explicitly stated (Kennedy et al. 1998) even when other information can be inferred (Brenner et al. 1996; Dietrich et al. 2001). Further, because management may have incentives to report the most favorable information, a loss-only disclosure may be perceived as a particularly negative signal about the magnitude of any upside potential (Hobson and Kachelmeier 2005). A second possibility is that investors infer that potential gains are equal to potential losses. Prior research supports the idea that individuals often believe or make judgments as if outcome distributions are symmetric (Ashton 1982). A recent accounting study supports this notion. Koonce et al. (2005) find that investors given short qualitative descriptions of financial instruments and derivatives often judge potential losses as equal to potential gains (data untabulated). Third, investors could infer that potential gains are larger than potential losses. However, there is no prior research suggesting that people will make this particular inference. Thus, we only consider the first two possibilities.

---

[4] Similar downside disclosures are required by SFAS No. 106 for post-retirement benefit obligations and SFAS No. 140 for securitizations (FASB 1990, 2000).

[5] Our review of actual disclosures shows that most companies do not voluntarily disclose upside potential. Specifically, we gathered Compustat data for 2002 for all firms in industries that make extensive use of food commodities (i.e., the scenario used in our experimental tests of one- versus two-sided disclosures). Of the 71 firms in this industry group, 19 presented sensitivity analysis disclosures related to commodity derivatives (the majority of the other companies indicated that their commodity derivative exposure was immaterial). Of the 19 companies presenting sensitivity disclosures, only one provided a two-sided disclosure. Anecdotal evidence suggests that firms avoid two-sided disclosures in light of concerns that they reveal proprietary information about risk-management strategies. For example, Hershey Foods objected to the SEC's 1996 proposals to require two-sided market-risk disclosures, arguing that such disclosures would reveal Hershey's views on the expected direction of cocoa prices (Louis 1997).

It is important to determine what investors infer about undisclosed gains because incorrect inferences could lead to erroneous risk assessments. For example, inferring that losses exceed gains is consistent with the company writing put options. This strategy, with its unlimited downside potential, is rarely used by manufacturing companies to manage risk (Bodnar and Gebhardt 1999). In contrast, inferring that undisclosed gains are equal to the disclosed losses would be consistent with the company using futures or forward contracts, a more common type of derivative strategy for manufacturing companies (Bodnar and Gebhardt 1999). Given these relative frequencies, the latter inference (i.e., that potential gains and losses are equal) would be correct more often than the former inference (i.e., that potential gains are smaller than potential losses). Thus, the potential problem with one-sided disclosures is not just that inadequate information impedes risk judgments, but rather that inadequate information could actually cause investors to make risk judgments consistent with a low-frequency (and quite risky) event. To ascertain investors' inferences about undisclosed potential gains, we compare risk judgments based on loss-only disclosures to those based on two-sided disclosures. Because prior research does not predict unequivocally what investors assume in the absence of explicit gain information, we posit two alternative hypotheses:

H2a: Risk assessments based on one-sided loss-only disclosures will be similar to those with two-sided disclosures that indicate potential losses are greater than potential gains.

H2b: Risk assessments based on one-sided loss-only disclosures will be similar to those with two-sided disclosures that indicate potential losses are equal to potential gains.

Will Two-Sided Disclosures Remedy the Effect of Loss-Only Disclosures?

We posit that two-sided disclosures will remedy the judgment difficulties created by one-sided, loss-only disclosures. However, for two-sided disclosures to be remedial, investors must use the potential gain and loss information to make risk judgments that distinguish among firms using different risk-management strategies. Although individuals may lack specific knowledge about derivatives and their potential outcomes, Luce and Weber's (1986) conjoint expected risk model suggests that the pattern of potential gains and losses can inform risk assessment. Specifically, Luce and Weber's (1986) model suggests that judged risk is highest when potential losses exceed potential gains and that judged risk will decrease as the magnitude of the potential gain increases relative to the magnitude of the potential loss.[6]

---

[6] Although empirical tests generally support the axioms of the conjoint expected risk model (Weber and Bottom 1989; 1990), little research explores the risk-judgment implications of the model. Thus, we add to the evidence pertaining to this descriptive risk model by testing the model's judgment implications in an important applied setting.

In summary, H2a and H2b concern the inferences that investors make about potential gains when reading loss-only disclosures. These inferences are likely to be systematic and may cause investors to erroneously render risk judgments that are consistent with infrequently used risk-management strategies. Two-sided disclosures can remedy this judgment problem if investors are able to use potential gain and loss information to make risk judgments that distinguish among firms with these differing strategies. The conjoint expected risk model (Luce and Weber 1986) suggests that relative gains and losses affect risk assessments. Thus we hypothesize:

> **H2c:** Risk judgments based on two-sided disclosures will be highest where potential losses are larger than potential gains, will be next highest when potential gains are equal to potential losses, and will be lowest when potential gains are larger than potential losses (holding either potential losses or gains constant).

III. EFFECTS OF LABELING

Experiment 1

Participants, Design, and Materials

Ninety M.B.A. students participated in experiment 1, which took about 25 minutes to complete. We used M.B.A. students to proxy for reasonably informed individual investors. Among our participants, 83 percent had previously invested in common stocks. We believe that our participants had a reasonable understanding of business and economics as, on average, they had five years of work experience and had taken three graduate finance and two graduate accounting classes. A question asking participants about their familiarity with financial instruments and derivatives suggests that they are moderately familiar with them (mean of 45.85 using a 101-point scale with 0 indicating not at all familiar, 50 indicating moderate familiarity, and 100 indicating complete familiarity).

Experiment 1 had a 3 × 2 mixed design. We varied the first variable, type of instrument, at three levels on a between-participants basis. We provided participants with a description of a company that either had: (1) fixed-rate debt, or (2) variable-rate debt with a variable-to-fixed-interest-rate swap, or (3) variable-rate debt with a variable-to-fixed-interest-rate swap labeled as a hedge. In the stimuli, we were careful to make the two derivative conditions the same except for the label. Consequently, in both the swap and hedge conditions, we described the financial item as "variable-rate debt combined with a variable-to-fixed-interest-rate swap." In the hedge condition, we added the phrase "used as a hedge." In both conditions, the company had the underlying variable-rate debt so the swap was not a speculative instrument. If interest rates increase, then the company wins in terms of interest cash flows on the swap and loses in terms of these cash flows on the variable-rate debt. This type of offsetting occurs in both the swap and hedge conditions, so that they were both *de facto* fixed-rate debt. Figure 1 shows the instruments' descriptions.[7]

The second variable, exposure information, was at two levels (before and after) and was manipulated on a within-participants basis. Initially, we provided participants with one of the three instruments and asked them to judge the risk of the instrument. Then, we

---

[7] To test the robustness of labeling effects, we also varied whether the short description of the instrument (included in Figure 1) was provided to participants. Results show no main or interactive effect of these descriptions (all p-values > 0.25).

FIGURE 1
Description of Financial Instruments Used in Experiments 1 and 2

Fixed interest-rate debt: This is a liability that obligates the company to make periodic interest payments that are fixed in amount.

Variable-rate debt combined with a variable-to-fixed-interest-rate swap: The variable-rate debt is a liability that obligates the company to make periodic interest payments that vary with the prevailing market rate of interest. The variable-to-fixed-interest-rate swap involves the company (denoted "A") having variable-rate debt for which it swaps the interest payments with another company (denoted "B"). Company A swaps its variable-rate interest payments for the fixed interest-rate payments of Company B. Thus, Company A no longer pays the prevailing (variable) market rate of interest; rather it pays a fixed rate.

Variable-rate debt combined with a variable-to-fixed-interest-rate swap used as a hedge: The variable-rate debt is a liability that obligates the company to make periodic interest payments that vary with the prevailing market rate of interest. The variable-to-fixed-interest-rate swap involves the company (denoted "A") having variable-rate debt for which it swaps the interest payments with another company (denoted "B"). Company A swaps its variable-rate interest payments for the fixed interest-rate payments of Company B. Thus, Company A no longer pays the prevailing (variable) market rate of interest; rather it pays a fixed rate.

provided participants with additional information about that instrument's cash-flow and fair-value exposures. Because all three instruments had the same cash-flow and fair-value exposure, this description was identical for all three instruments. Figure 2 shows this information. After studying this additional information, we asked participants to re-assess the instrument's risk. Thus, participants made risk judgments both before and after we introduced the exposure description, creating two levels of the exposure-information variable (i.e., before and after). For our dependent variable, we asked participants to judge the risk associated with the financial instrument. For example, "Overall, how risky do you consider variable-rate debt with a variable-to-fixed-interest-rate swap (used as a hedge)?" We used a 101-point scale with endpoints labeled "no risk" (0) and "high risk" (100).

Results

Panel A of Table 1 shows the descriptive statistics for experiment 1. An analysis of variance (ANOVA) reveals that the overall model is significant ($F_{1,87} = 459.92$, $p < 0.01$). We use two planned contrasts to test our specific hypotheses.[8] Hypothesis 1a predicts that in the absence of exposure information, investors will assess the instrument labeled as a swap (with no hedge label) as riskier than the instrument labeled as fixed-rate debt. As predicted, the mean risk assessment for the swap (44.43) is statistically significantly higher than for the fixed-rate debt (35.43) ($t_{87} = 1.78$, $p = 0.04$). These results support H1a.

In H1b, we predict that in the absence of exposure information, participants will assess the instrument labeled as a hedge as less risky than the instrument labeled as a swap. As expected, the mean risk assessment for the hedge (37.17) is lower than that for the swap

---

[8] For statistical tests where we hypothesize specific and directional comparisons, we perform one-tailed, planned contrasts using the appropriate error term from the overall analysis of variance rather than rely on the omnibus tests that are nondirectional, two-tailed tests (Judd et al. 1995). In all cases where we perform such tests, though, we do note the relevant omnibus test result. For experiment 1, the omnibus main effect for instrument type is significant at $p = 0.15$ on a two-tailed basis ($F_{2,87} = 1.95$).

FIGURE 2

Description of Exposure Information Used in Experiments 1 and 2

Cash Flow Effects

An increase in interest rates would not change the net interest payment cash flows of the *[instrument previously provided to the participant]*. That is, the company would be "locked into" paying the same net cash amount of interest.

A decrease in interest rates would not change the net interest payment cash flows of the *[instrument previously provided to the participant]*. That is, the company would be "locked into" paying the same net cash amount of interest.

Fair Value Effects

An increase in interest rates would create an economic gain because the company would not have to pay the higher, current market rate of interest. In other words, if interest rates increase, then the fair value of this *[instrument previously provided to the participant]* would decrease. This would cause an economic gain.

A decrease in interest rates would create an economic loss because the company would still have to pay the higher fixed rate of interest. In other words, if interest rates decrease, then the fair value of this *[instrument previously provided to the participant]* would increase. This would cause an economic loss.

(44.43) (t_{87} = 1.43, p = 0.08). These results support H1b. Although we do not make predictions for the relation between risk assessments for fixed-rate debt and the hedge, results show that they are not statistically different from each other (35.43 versus 37.17, t_{87} = 0.35, n.s.).

Hypothesis 1c states that these labeling effects will dissipate after investors read descriptions of the cash-flow and fair-value exposures associated with the financial instruments. Thus, H1c implies an interaction between type of instrument and exposure information. We fail to find support for H1c, as test results reveal that this interaction is not statistically significant ($F_{2,87}$ = 0.91, n.s.). Follow-up tests reveal that while the mean assessed risk for the swap (43.83) and the fixed-rate debt (39.17) no longer differ (t_{87} = 0.92, p = 0.18), the swap (43.83) and hedge (34.60) are still reliably different (t_{87} = 1.82, p = 0.04).[9] Thus, our results do not support the notion that listing and describing the component exposures will remedy labeling effects, at least for the swap and hedge comparison. Perhaps the insurance connotation of the label hedge is particularly strong, overwhelming the effect of the exposure information.

---

[9] Wilcoxon ranks tests confirm the results of the parametric tests (swap versus fixed without exposure information, $Z = -1.76$, $p < 0.04$; swap versus hedge without exposure information, $Z = 1.29$, $p < 0.10$; swap versus fixed with exposure information, $Z = -1.15$, $p > 0.10$; swap versus hedge with exposure information, $Z = 2.02$, $p < 0.03$). In fact, for all tests reported in the paper, the results of nonparametric tests corroborate those conducted with parametric tests.

TABLE 1
Experiment 1 Results: Risk Assessments and Hypotheses Tests[a]

Panel A: Descriptive Statistics—Mean (Standard Deviation)

Type of Instrument	Before Exposure Information	After Exposure Information
Fixed-rate debt (F) (n = 30)	35.43 (18.47)	39.17 (18.29)
Variable-rate debt with a variable-to-fixed-interest-rate swap (V-to-F) (n = 29)	44.43 (21.85)	43.83 (17.60)
Variable-rate debt with a variable-to-fixed-interest-rate swap used as a hedge (V-to-F hedge) (n = 30)	37.17 (18.87)	34.60 (22.15)

Panel B: Hypotheses Tests

Hypothesis	Comparison	Statistic	df	p-value
H1a	Swap versus Fixed (before exposure information)	t = 1.78	87	0.04
H1b	Swap versus Hedge (before exposure information)	t = 1.43	87	0.08
H1c	Interaction of type of financial instrument and exposure description	F = 0.91	2,87	0.41
	Follow-up comparisons:			
	Swap versus Fixed (after exposure information)	t = 0.92	87	0.18
	Swap versus Hedge (after exposure information)	t = 1.82	87	0.04

[a] This table shows the results for experiment 1 that investigated how labeling influences investors' risk judgments and whether additional information describing cash-flow and fair-value exposures eliminates the effect of labeling. Panel A shows summary statistics by experimental condition and Panel B reports the planned contrasts designed to test H1a, H1b, and H1c. All contrasts use the relevant error term from the overall analysis of variance. The type of instrument variable was at three between-participants levels. In the fixed-rate debt condition, participants were provided with a description of fixed-rate debt; in the variable-debt with a variable-to-fixed swap condition, participants were given a description of variable-rate debt along with an interest-rate swap that synthetically transformed the debt into fixed rate; in the variable-debt with a variable-to-fixed swap hedge condition, participants were given a description of variable-rate debt along with an interest-rate swap that synthetically transformed the debt into fixed rate, and they were told that the swap was used as a hedge. The exposure information variable was at two within-participants levels: the first risk judgment was made before participants were given a description of the cash flow and fair-value exposures associated with the instrument, and the second risk judgment was made after participants were given this information. The risk question asked participants to judge the overall risk of the financial instrument on a 101-point scale, with 0 representing "no risk" and 100 representing "high risk."

Experiment 2

Participants, Design, and Results

It is possible that experiment 1 participants had difficulty making *absolute* risk judgments based on a description of one financial instrument. To address this issue, we conducted an additional experiment where participants could make *relative* risk judgments, an easier task (Hsee 1996). Specifically, in experiment 2, we recruited another 100 M.B.A. students with similar demographics as those in experiment 1 and simultaneously presented them with *all three* instruments used in experiment 1. We told them to assume that three *otherwise identical* companies each had one of the three instruments. We asked participants to "rank the three companies in terms of how risky an investor would think they are" with 1 representing the most risky company and 3 indicating the least risky. Importantly, we told participants that ties were allowed, so they could rank any or all instruments as equally risky. We then provided them with the cash-flow and fair-value information, identical to that in experiment 1, and indicated that this information applied to all three financial instruments. After participants read the exposure information, we asked again for risk rankings. Thus, we employed a 3 × 2 within-participants design.

Including all three financial positions simultaneously allows participants to make relative risk judgments and should reduce the noise in their judgments. This design also allows participants to correct any errors or inconsistencies in their responses (Libby et al. 2002). Importantly, this design biases our tests of H1a and H1b toward *not finding* a difference in risk judgments as it makes it more obvious to the participants that the three instruments are economically the same.

As shown in Table 2, mean original risk rankings are 1.64 for the swap firm, 2.05 for the firm with fixed-rate debt, and 2.16 for the hedge firm. Recall that lower scores represent greater risk. Results show an overall main effect for the instrument type variable ($F_{2,198} = 9.78$, $p < 0.01$). Specific contrast tests show that the mean ranking is significantly lower (i.e., higher risk) for the swap firm than the firm with fixed-rate debt ($t_{198} = 2.64$, $p < 0.01$) and for the swap firm than the hedge firm ($t_{198} = 3.32$, $p < 0.01$). More important, these labeling effects do not dissipate after participants read a description of the cash-flow and fair-value exposures associated with the financial instruments ($F_{2,198} = 0.40$, n.s.).

TABLE 2
Experiment 2 Results: Risk Rankings and Hypotheses Tests[a]

Panel A: Descriptive Statistics—Mean (Standard Deviation)

Type of Instrument	Before Exposure Information	After Exposure Information
Fixed-rate debt (F) (n = 100)	2.05 (0.95)	1.98 (0.91)
Variable-rate debt with a variable-to-fixed-interest-rate swap (V-to-F) (n = 100)	1.64 (0.64)	1.67 (0.67)
Variable-rate debt with a variable-to-fixed-interest-rate swap used as a hedge (V-to-F hedge) (n = 100)	2.16 (0.79)	2.08 (0.84)

Panel B: Hypothesis Tests

Hypothesis	Comparison	Statistic	df	p-value
H1a	Swap versus Fixed (before exposure information)	t = 2.64	198	0.01
H1b	Swap versus Hedge (before exposure information)	t = 3.32	198	0.01
H1c	Interaction of type of instrument and exposure description	F = 0.40	2,198	0.67
	Follow-up comparisons:			
	Swap versus Fixed (after exposure information)	t = 1.99	198	0.02
	Swap versus Hedge (after exposure information)	t = 2.64	198	0.01

---

[a] This table shows the results for experiment 2 that investigated how labeling influences investors' risk judgments when all three instruments are simultaneously presented to study participants. Panel A shows summary statistics by experimental condition and Panel B reports the planned contrasts designed to test H1a, H1b, and H1c. All contrasts use the relevant error term from the overall analysis of variance. The type of instrument variable was at three within-participants levels (see Table 1 for descriptions of the instruments) and the exposure variable was at two within-participants levels (see Table 1 for a description of this variable). Participants were presented with all three instruments and asked to assume that three otherwise identical companies each had one of these instruments. The risk question asked participants to rank the three firms in terms of riskiness, with 1 representing the most risky company and 3 indicating the least risky. Ties were allowed.

Instead, investors still judge the firm with the swap as riskier than the firm with fixed-rate debt (means of 1.67 and 1.98, respectively; $t_{198} = 1.99$, $p = 0.02$) and the firm with the hedge (mean of 2.08; $t_{198} = 2.64$, $p < 0.01$). Overall, these results corroborate those of experiment 1, showing that supplementary exposure disclosures do not eliminate labeling effects.[10]

In experiment 2, we also asked participants to rank the three companies in terms of likelihood that an investor would choose the company as an investment with 1 representing the most likely, 2 next most likely, and 3 least likely; again, we explicitly allowed ties. Although there is a significant main effect for instrument type ($F_{2,196} = 10.71$, $p < 0.01$), the before and after rankings are similar ($F_{2,196} = 0.60$, n.s.). Before seeing the exposure information, the mean preference ranking for the company with the swap (2.10) is similar to that of fixed-rate debt (2.05; $t_{196} = 0.33$, n.s.) but higher than for a hedge (1.70; $t_{196} = 2.60$, $p < 0.01$). Thus, the swap firm is less preferred as an investment than the hedge firm but the swap firm is preferred equally to the firm with fixed-rate debt. After the exposure information, the swap and fixed-rate debt firms are again ranked similarly (2.07 versus 2.08; $t_{196} = 0.06$, n.s.) and again the firm with the swap is less preferred to that with the hedge (2.07 versus 1.58; $t_{196} = 3.16$, $p < 0.01$). These results extend our experiment 1 results by showing that labels also influence investors' preferences.

When comparing the investment preference patterns with the risk rankings, it is important to keep in mind that investment preferences reflect more than perceived risk. In particular, risk attitude is a major determinant of investment preferences (von Neumann and Morgenstern 1947; Schoemaker 1980). In our experiments, we did not control or measure risk attitudes, nor assume that they are homogeneous across our participants. While risk-seeking, risk-neutral, and risk-averse persons may agree that a swap is riskier than fixed-rate debt (as, on average, our participants do), our sample may be evenly split in terms of the number of participants who are risk seeking (i.e., prefer the swap) versus those who are risk averse (i.e., prefer fixed-rate debt). Although we might expect that risk seekers would eschew the firm with the hedge, its high average preference ranking is consistent with prior experimental results that show there is a special utility associated with insurance (Schoemaker 1980). In summary, investment choices or likelihoods have multiple determinants; perceived risk is one determinant.

Additional Analysis

Additional data provide further support for our hypotheses. First, we asked participants to rate the extent to which financial instruments used for (1) hedging and (2) non-hedging purposes are similar to insurance. We used a 101-point scale, and labeled 0 "not at all like insurance" and 100 "very similar to insurance." The mean judgment for hedging instruments is significantly larger than for instruments used for non-hedging purposes (74.91 and 30.28 respectively, $t_{99} = 14.41$, $p < 0.01$). Consistent with our theory, investors view hedges as insurance.

Second, we asked participants (1) how easily they could recall or imagine situations where firms have major losses due to the use of (a) derivatives and (b) basic financial instruments, and (2) how strongly such instruments were linked in the participant's mind to major losses. These recall and linkage questions measure availability, as described by

---

[10] Additional analyses comparing those participants with high (self-assessed) knowledge about derivatives to those with lower knowledge indicate that knowledge does not affect our results. Further, using demographic data to partition participants into high- and low-knowledge groups (e.g., work experience, specific courses in derivatives) also does not affect our results.

Tversky and Kahneman (1973). We computed composite availability difference scores by adding the ratings provided for the derivatives' recall and link questions and subtracting the analogous ratings provided for the basic instruments' questions. All questions used a 101-point scale with high scores indicating high availability. The mean difference score is 14.90, which is statistically significantly greater than zero ($t_{99} = 2.04$, $p < 0.05$), consistent with our conjecture that financial problems are more cognitively available for derivatives than for other types of financial instruments.

To ensure that perceptions about counterparty risk did not drive our results, we asked participants to list the types of risks they considered in making their risk rankings. We gathered these data using an open-ended question to avoid demand effects. Only 11 of the 100 participants mentioned counterparty, default, or credit risk. Excluding these 11 participants does not change the results for our hypotheses tests and, thus, we rule out counterparty risk as an explanation for our results.[11]

Further, to ensure that our results are not driven by participants who may have interpreted the word hedge as "qualifies for hedge accounting," we partitioned participants based on their answers to a question about the accounting for swaps versus hedges. Specifically, we separated the responses of those participants who indicated that the accounting methods for these derivatives were always or sometimes different (29 percent) and the responses of those who indicated that the accounting was always the same or that they did not know about the accounting. The former group may have inferred that different accounting would be used for the various instruments, while the latter group would be unaware of this possibility. Comparisons of the risk rankings of the swap versus hedge conditions for each group indicate these instruments are judged in similar ways by the two groups ($F_{1,98} = 0.70$, $p > 0.10$). Specifically, mean rankings for the participants who indicate that the accounting may or does differ for these instruments are 1.55 (1.66) for the swap and 2.21 (2.14) for the hedge before (after) the exposure information ($t_{198} = 2.26$, $p < 0.02$ and $t_{198} = 1.67$, $p < 0.05$, respectively). For the group unaware of hedge accounting rules, mean rankings for the instruments are 1.68 (1.68) for the swap before (after) exposure information and 2.14 (2.06) for the hedge ($t_{198} = 2.51$, $p < 0.01$ and $t_{198} = 2.06$, $p < 0.03$, respectively). Thus, we conclude that our results are not driven by participants interpreting the label hedge as suggesting a particular accounting method.

Overall, our experiment 1 and 2 results show that labels affect risk judgments, and support our premise that labels can cause investors to judge risk differently for financial instruments that have the same underlying economic exposures. Indeed, our results indicate that instruments labeled as derivatives (i.e., hedge or swap) trigger specific mental associations that systematically affect risk assessments in ways that cannot be explained by economic analysis. Supplementary exposure information does not overcome this effect.

---

[11] Also note that the concern about counterparty risk only applies to H1a where one instrument potentially has counterparty risk and the other does not. For H1b, counterparty risk is irrelevant as it should affect the swap and the hedge conditions equally.

IV. EFFECTS OF ONE-SIDED VERSUS TWO-SIDED DISCLOSURES

Experiment 3

Participants, Materials, and Design

People who participated in the first experiment also participated in experiment 3 immediately thereafter.[12] Experiment 3 had a 2 × 3 mixed design and involved a company that sells food snacks. The company used commodities to manufacture the snacks and, thus, faced risks from commodity price fluctuations. We examine the effect of market-risk disclosures related to these commodity price exposures. The first variable, disclosure balance, was manipulated within participants and was at two levels: one-sided loss-only disclosure or two-sided loss and gain disclosure. Consistent with current risk disclosure requirements, we initially provided all participants with a one-sided risk disclosure describing the potential loss associated with a 10 percent unfavorable commodity price change. Once participants assessed the risk of the company's commodity position based on this one-sided disclosure, they read a two-sided disclosure for the same commodity position. We informed participants that they had continued to search the annual report of the company in the case and, in doing so, had discovered the gain disclosure. Then, we asked them to re-assess the risk of the company's commodity position, indicating that they were free to retain or revise their original responses. Panel A of Figure 3 shows the one-sided risk disclosure.

The second manipulated variable was the relative size of the potential gains and losses described in the two-sided disclosure. We refer to this as the G/L pattern and this was varied at three levels on a between-participants basis. That is, after all participants responded to the loss-only disclosure (which was the same for all participants), they considered one of three loss-and-gain disclosures. Importantly, the loss amount in the three two-sided disclosures was identical to that described in the one-sided disclosure. What varied in the two-sided disclosure was the potential gain arising from a 10 percent *favorable* price movement. Specifically, in the $L = G$ condition, the disclosed potential gain and loss were equal; in the $L > G$ condition, the disclosed potential loss was greater than the potential gain; in the $G > L$ condition, the disclosed potential gain was greater than the potential loss. These disclosures are shown in Panel B of Figure 3.

We told participants in all three G/L conditions that the company used derivatives, such as commodity futures and options, to manage price exposures on some of their existing inventories and on some portion of their anticipated future purchases. As noted earlier, the $G > L$ condition was consistent with purchased call options where the company protected itself on the downside (from commodity price increases) but would benefit from any gains on the upside (from commodity price decreases). The $L = G$ condition with its symmetric outcomes was consistent with the company managing risk with futures and/or forwards but not options. Finally, the larger loss in the $L > G$ condition was consistent with the company having written put options. This strategy caused the company to have no protection on the downside but limited upside potential.

Results

Panel A of Table 3 shows the risk judgments for both the one- and two-sided disclosures, and Panel B shows our statistical tests. As would be expected given random assignment, the first risk assessment based on the one-sided disclosure does not vary across the

---

[12] For that reason, we used different companies, exposures, and financial instruments in these two experiments. To control for carryover effects, we included a demographic-information task between experiments 1 and 3. Given the between-participants design of both experiments, we were able to combine the cells of experiment 1 with those of experiment 3 in a completely counterbalanced design. Statistical tests reveal that the experiment 1 manipulations do not affect the responses to experiment 3 ($p > 0.10$), indicating no carry-over effects.

FIGURE 3
Description of Financial Disclosures used in Experiments 3 and 4

Panel A: One-Sided Disclosure (used in Experiment 3 only)

In the normal course of business, the SaltySnack Company purchases commodities such as oats, corn, corn sweetener, and wheat. The Company uses derivatives such as commodity futures and options to manage price exposures on *some* of their existing inventories and on *some* portion of their anticipated future purchases. Consequently, the SaltySnack Company has a net commodity exposure to changes in prices on existing inventory, on the commodity derivatives the company uses, and on anticipated purchases of inventory over the coming year. You read SaltySnack's annual report and find the following information.

The following table illustrates how a *hypothetical 10% unfavorable* change in market prices would affect SaltySnack's **net income** over the coming year due to SaltySnack's net commodity exposure.

Hypothetical change in market prices	**(Decrease) in next year's net income** in dollars	**(Decrease) in next year's net income** as a percentage of next year's net income
10% ***Unfavorable*** change would lead to:	$(68,061,000)	(14.64)%

Panel B: Two-Sided Disclosures (used in both Experiments 3 and 4)

The following table illustrates how a *hypothetical 10% unfavorable change* and a *hypothetical 10% favorable change* in market prices would affect SaltySnack's **net income** over the coming year due to SaltySnack's net commodity exposure.

Condition: $L = G$

Hypothetical change in market prices	**Increase (decrease) in next year's net income** in dollars	**Increase (decrease) in next year's net income** as a percentage of next year's net income
10% ***Unfavorable*** change would lead to:	$(68,061,000)	(14.64)%
10% ***Favorable*** change would lead to:	$68,061,000	14.64%

Condition: $L > G$

Hypothetical change in market prices	**Increase (decrease) in next year's net income** in dollars	**Increase (decrease) in next year's net income** as a percentage of next year's net income
10% ***Unfavorable*** change would lead to:	$(68,061,000)	(14.64)%
10% ***Favorable*** change would lead to:	$39,295,000	8.45%

(continued on next page)

FIGURE 3 (continued)

Condition: $G > L$

Hypothetical change in market prices	**Increase (decrease) in next year's net income** in dollars	**Increase (decrease) in next year's net income** as a percentage of next year's net income
10% ***Unfavorable*** change would lead to:	$(68,061,000)	(14.64)%
10% ***Favorable*** change would lead to:	$117,885,000	25.36%

three conditions ($F_{2,86} = 0.08$, n.s.). We do see a significant interaction, though, between balance (one- versus two-sided) and the G/L pattern of the gain and loss information ($F_{2,86} = 14.10$, $p < 0.01$), as anticipated. Comparing the responses for the one- versus two-sided disclosures reveals that the mean risk judgment for the one-sided disclosure is not distinguishable from the mean risk judgment in the two-sided $L > G$ condition (71.43) ($t_{86} = 1.04$, n.s.), but is systematically larger than the mean risk judgments in the $L = G$ (56.62) and $G > L$ (47.90) conditions (both p-values < 0.01). These results are consistent with H2a (but not H2b) and suggest that, on average, participants judge risk as if the undisclosed potential gain is smaller than the disclosed potential loss amount.[13]

Consistent with H2c, and with the predictions of the conjoint expected risk model (Luce and Weber 1986), we find that two-sided disclosures significantly impact participants' risk judgments ($F_{2,86} = 13.77$, $p < 0.01$). Specific contrasts reveal that the mean risk judgment for the $L > G$ condition is higher than the mean risk judgment for the $L = G$ condition ($t_{86} = 3.24$, $p < 0.01$) and the $G > L$ condition ($t_{86} = 5.19$, $p < 0.01$). Further, the mean risk judgment for the $L = G$ condition is higher than the mean for the $G > L$ condition ($t_{86} = 1.91$, $p < 0.03$).[14] These results indicate that the relative sizes of the potential loss and gain in a two-sided disclosure systematically influence investors' risk judgments.[15]

---

[13] To further verify that investors with loss-only disclosures infer that gains are smaller than potential losses, we later asked study participants to indicate what investors would *infer* about the potential gain amount if a given company disclosed only loss outcomes, as required. The majority (66 percent) say that investors would *infer* that gains are smaller than losses, with 19 percent (15 percent) indicating that investors would infer that gains are larger than (equal to) losses.

[14] To ensure that risk judgments are determined by the relative potential gain *and* loss amounts rather than simply the level of gains varied in experiment 3, we collected additional data from a separate group of 105 participants with similar backgrounds and work experience as those in experiment 3. We asked these participants to provide risk judgments after receiving (only) a two-sided disclosure in which the gain amount was *held constant* at approximately \$68 million, but the potential loss amount was varied between-participants at approximately \$117 million, \$68 million, and \$39 million. Results are consistent with those reported in experiment 3, as the mean risk judgments for these three conditions are 74.23, 65.23, and 48.63, respectively ($t_{104} = 1.79$, $p < 0.04$ for $L > G$ versus $L = G$; $t_{104} = 3.31$, $p < 0.01$ for $L = G$ versus $G > L$).

[15] Although the most popular traditional finance model (Markowitz 1952) suggests that individuals use variance to assess risk, we do not expect to find this behavior in light of prior judgment research (e.g., Slovic 1967). Indeed, our results are not consistent with participants judging risk according to variance. In our experiment, where only two outcomes are listed, variance is highest for the $G > L$ condition and lowest for the $L > G$ condition. This pattern of variances suggests a risk ranking that is opposite of the one we predict and find in experiment 3. While this finding may seem non-normative, theoretical research in finance proposes several models based on other risk measures such as skewness (Arditti 1967; Kraus and Litzenberger 1976). While we do not explicitly test these models, our findings are directionally consistent with models based on skewness.

TABLE 3
Experiment 3 Results: Risk Assessments and Hypotheses Tests[a]

Panel A: Descriptive Statistics—Mean (Standard Deviation)

Gain/Loss Patterns	Balance: Loss-Only (One-Sided) Disclosure	Balance: Loss and Gain (Two-Sided) Disclosure
Loss > Gain (n = 30)	68.00 (16.81)	71.43 (9.77)
Loss = Gain (n = 29)	69.79 (18.59)	56.62 (20.94)
Gain > Loss (n = 30)	68.70 (17.46)	47.90 (19.69)

Panel B: Hypotheses Tests

Contrast	df	Statistic	p-value
Interaction of balance and G/L pattern	2,86	F = 14.10	0.01
Follow-up tests for H2a and H2b:			
One-sided versus two-sided disclosures: Loss-only versus Loss > Gain	86	t = 1.04	0.30
One-sided versus two-sided disclosures: Loss-only versus Loss = Gain	86	t = 3.93	0.01
One-sided versus two-sided disclosures: Loss-only versus Gain > Loss	86	t = 6.31	0.01
Follow-up tests for H2c:			
Two-sided disclosures: Loss > Gain versus Loss = Gain	86	t = 3.24	0.01
Two-sided disclosures: Loss > Gain versus Gain > Loss	86	t = 5.19	0.01
Two-sided disclosures: Loss = Gain versus Gain > Loss	86	t = 1.91	0.03

---

[a] This table shows the results for experiment 3 that investigated how disclosure balance and gain/loss (G/L) pattern influence investors' risk judgments. Panel A presents the summary statistics by condition, and Panel B reveals the planned contrasts designed to test H2a, H2b, and H2c. All contrasts use the relevant error term from the overall analysis of variance. The disclosure balance variable was at two within-participants levels: (1) a risk assessment based on a one-sided, loss only disclosure and (2) a risk assessment based on a two-sided, loss and gain disclosure. The G/L pattern of two-sided disclosure was at three between-participants levels. In the L = G condition, the gain amount was identical to the loss amount (which was the same amount as provided to all participants in the initially presented one-sided disclosure); in the G > L condition, the gain amount was greater than the loss amount, which was the same amount as provided initially to all participants; and, finally, in the L > G condition, the gain amount was smaller than the loss amount, which was the same amount as provided initially to all participants. The risk question asked participants to judge the overall risk of the company's net commodity exposure on a 101-point scale, with 0 representing "no risk" and 100 representing "high risk."

Additional Analysis

Our results show that when given a one-sided disclosure, investors infer that the undisclosed potential gain is smaller than the disclosed potential loss. That is, risk judgments with loss-only disclosures are consistent with the inference that the company is writing options—a strategy that empirical evidence suggests is rarely used by manufacturing firms (Bodnar and Gebhardt 1999). While this arguably represents a judgment error, more conclusive evidence would be provided if we showed that our participant population understands that written puts are an uncommon strategy for manufacturing companies like the one used in our experiment.

To provide such evidence, we presented the snack food scenario used in experiment 3 to another group of 80 M.B.A. students (from the same population with the same characteristics as in our main experiments) and asked them to evaluate how often that type of company would use futures contracts, written put options, and purchased call options to manage commodity price exposures. Consistent with empirical frequencies (Bodnar and Gebhardt 1999), participants judge futures as more frequently used (average judgment of 61.49 out of 100 cases of derivative use) than purchased calls (26.27), which are judged as more frequently used than written puts (12.24) (all means differ from each other at p-values < 0.01). Only four participants believe that written puts are the most frequent derivative strategy. In contrast, 62 participants believe that futures contracts are most frequently used.[16]

Taken together, these results may seem contradictory. On one hand, participants judge risk as if they infer the company is writing options but, on the other hand, participants know that these firms do not often write options. However, research on the base-rate fallacy reconciles these results (e.g., Kahneman and Tversky 1973). That research demonstrates that when making probability judgments about possible events, individuals often ignore the base rates, or underlying frequency, of those events. Instead, people judge the event by using other individuating information. Thus, when our study participants read a one-sided disclosure, they exhibit this type of behavior by failing to consider the relative frequency of various derivative strategies. Indeed, it appears that they are strongly affected by loss information that is explicitly stated (Kennedy et al. 1998) and view the loss-only disclosure as a particularly negative signal about the magnitude of any upside potential (Hobson and Kachelmeier 2005).

Experiment 4

Participants, Materials, and Design

As experiment 3 shows, two-sided gain/loss disclosures remedy the judgment error brought on by one-sided disclosures currently mandated by accounting standards. That is, two-sided disclosures allow investors to make risk judgments that discriminate among different risk-management strategies. As suggested earlier, two-sided disclosures also may convey an additional benefit by permitting investors to infer the type of risk-management (i.e., derivative) strategy a company uses. To address this possibility, we asked an additional 100 M.B.A.s from the same population to respond to the same case materials as the experiment 3 participants.[17] In this additional data collection, we simultaneously presented all three two-sided disclosures used in experiment 3 and asked participants to assume that three otherwise identical companies each made one of the three disclosures (i.e., we used a three-way, within-participants design). Participants ranked the three firms by their relative risk indicating the highest risk with a 1, second highest with a 2, and third with a 3, with ties allowed. After the risk elicitation, we presented participants with a list of three derivatives

---

[16] Thirty-one percent of the respondents to this additional data collection also participated in experiment 3. The results from the repeat participants are virtually identical to those who did not previously participate (i.e., status as a repeat or new participant does not interact with instrument in affecting frequency judgments). We conclude that these groups are homogeneous in their knowledge of derivative frequencies.

[17] Persons who participated in experiment 2 also participated in experiment 4 immediately thereafter.

(i.e., purchased call options, futures contracts, and written put options) and asked them to match the three gain/loss patterns (i.e., $G > L$, $L = G$, $L > G$) to the derivatives. We also allowed them to indicate if they did not know the answer.

Results

As expected, the risk-ranking results replicate the pattern documented in experiment 3.[18] That is, risk in the $L > G$ condition is judged as highest risk (mean of 1.56), followed by $L = G$ (mean of 1.93), and then followed by $L < G$ (mean of 2.31) (all means statistically different at $p < 0.01$).[19] For the matching task, about 20 percent of participants indicate they do not know the derivative that matches the G/L pattern. However, 66 percent correctly match the $L = G$ scenario with the futures contracts, 52 percent correctly match the $L > G$ scenario with the written put options, and 54 percent correctly match the $G > L$ scenario with the purchased call options. For each of the three scenarios, the percentage of correct responses is statistically higher than chance (all p-values < 0.01) and the incorrect responses are diffuse (i.e., no incorrect derivative choice is chosen by more than 14 percent of the respondents). Overall, these results show that many participants are able to use two-sided disclosures to infer the correct derivative strategy producing that pattern of gains and losses.

Because not all investors were able to successfully use the two-sided disclosures to infer the types of derivatives being used, we next compared the risk responses of those who were able to correctly identify the derivative strategy from the two-sided disclosure with those who were unable to do so. Specifically, one group included the 44 participants who correctly identified the derivative strategies for all three patterns, and the other group included the participants who identified *some* strategies incorrectly *or* that indicated uncertainty about the strategies. An ANOVA with the risk ranking as the dependent variable along with the G/L pattern and higher/lower knowledge partition as independent variables reveals that knowledge does not interact with the G/L pattern ($F_{2,196} = 0.18$, n.s.). That is, the risk rankings of those who did not correctly identify all derivative strategies (i.e., the low-knowledge group; mean ratings of 1.54, 1.96, and 2.29 for $L > G$, $L = G$, and $G > L$, respectively) mimic those of the high-knowledge group (1.59, 1.89, and 2.34, respectively). Two-sided disclosures allow less-knowledgeable investors to assess risk similarly to more-knowledgeable investors, and for both groups the pattern of risk judgments is consistent with predictions based on the conjoint expected risk model (Luce and Weber 1986).

Taken together, our experiment 3 and 4 results show that investors given one-sided disclosures make similar risk judgments for situations involving different underlying economic exposures. Further, we demonstrate that these risk judgments are likely to be in error as they are based on inferences about a pattern of potential loss and gain outcomes that is associated with an infrequently used derivative strategy. We also show that two-sided disclosures overcome these problems. That is, two-sided disclosures allow investors to make risk judgments that discriminate among different derivative strategies, and also enable many investors to identify the specific derivative strategy a firm is using to manage its risk. Moreover, two-sided disclosures are beneficial as they enable those investors who do not understand the intricacies of derivatives to judge risk similarly to those who are more knowledgeable about derivatives.

---

[18] We asked experiment 4 participants to describe how they ranked the riskiness of the three conditions. Most participants (i.e., 46 percent) indicate that they form their judgments by comparing the relative amounts of the loss versus gain outcomes, consistent with H2c. The remaining participants indicate that their risk rankings reflect the downside potential only (10 percent), the upside potential only (14 percent), the expected value of the gain and loss (16 percent), the variance of the gain and loss outcomes (11 percent), and other (3 percent).

[19] We extend experiment 3 by demonstrating that the three disclosures lead to different investment likelihoods as well ($F_{2,198} = 40.28$, $p < 0.01$). Results show that the $G > L$ firm is judged a more likely investment (mean ranking of 1.46) than the $L = G$ firm (mean of 1.98; $t_{198} = 4.36$, $p < 0.01$), and the $L = G$ firm is a more likely investment than the $L > G$ firm (mean of 2.53; $t_{198} = 4.62$, $p < 0.01$).

V. DISCUSSION

This study demonstrates that the information that firms currently provide about their financial instruments and derivatives causes systematic problems for investors' risk judgments. Through a series of experiments, we demonstrate two judgment problems. First, we show that the labels firms use to describe financial instruments have a powerful (and likely unintended) effect on investors' risk judgments. Second, we also show that loss-only disclosures cause investors to make erroneous inferences about undisclosed gains. Indeed, loss-only disclosures cause investors to render risk judgments that are consistent with infrequently used derivatives. From this evidence, we conclude that labels lead investors to view *equivalent* positions as *different* and that one-sided risk disclosures force investors to view *different* positions as *equivalent* and cause them to render risk judgments that correspond to low-frequency, high-risk events. In both cases, something other than the underlying economics of the instruments influences investors' risk judgments.

We also test whether additional information can alleviate these judgment problems. Interestingly, additional information describing the economic exposures of financial instruments does not eliminate labeling effects, but two-sided disclosures do eliminate the problems brought on by loss-only disclosures. Importantly, knowledge about specific derivatives is not necessary for people to use two-sided disclosures to differentiate among different risk-management strategies.

The insights in this paper are of potential use to firm managers and regulators. Firm managers should be interested in our findings as they indicate that currently available information about financial instruments and derivatives systematically influences investors' risk judgments in ways not suggested by the economics. These misperceptions about risk are important because they can have implications for firm pricing (Guay et al. 2003). Our findings should prove significant to regulators as they continue to revise and generate new risk-related standards. For example, our finding that participants associate the term hedge with insurance (and judged risk accordingly) raises some concerns regarding use of the term hedge accounting. That is, do investors infer that hedge accounting implies that all relevant risks are controlled and do regulators desire this type of inference? In addition, our results indicate strong reasons to mandate two-sided market risk disclosures: investors are currently making spurious inferences absent this balanced disclosure.

Our experiments have several limitations and, thus, suggest additional research. First, although our experimental participants are familiar with financial instruments and derivatives and have some business and investing experience, they are not experts in financial instruments and derivatives. Future research could replicate and extend our results with more seasoned investors. Second, our experiment does not expose the participants' judgments to the discipline of a market. Although prior research indicates that markets may not remove systematic judgment effects such as we find (Ganguly et al. 1994), the impact of a competitive market is not certain and could be explored.

Third, there are several possible reasons that our risk exposure information does not eliminate the effects of labels. Perhaps availability effects are too strong for debiasing to work (Slovic et al. 1982). Alternatively, perhaps availability can be debiased, but the relatively pallid exposure information we provided was not sufficient to do so, relative to the more salient and elaborated memories or beliefs associated with the labels. Tversky and Kahneman (1973) find that information's salience affects its memorability, availability, and impact. Drawing on their ideas, future research could provide more vivid exposure information and investigate whether or when such information will debias the labeling effects we observe. Another possible reason that the exposure information does not eliminate the labeling effects is that investors may assume that firms use different labels to signal economic differences. In this case, the experimental participants may assume that the (equivalent) cash flow and fair value exposures are only a part of the risks related to the instruments. Future research could investigate these ideas. In summary, there are many directions for future research on the important topic of how risk-relevant information is communicated to and evaluated by investors.

REFERENCES

Arditti, F. 1967. Risk and the required return on equity. *Journal of Finance* 22 (March): 19–36.

Ashton, R. 1982. *Human Information Processing in Accounting*. Studies in Accounting Research No. 17. Sarasota, FL: American Accounting Association.

Bodnar, G, and G. Gebhardt. 1999. Derivatives usage in risk management by U.S. and German non-financial firms: A comparative survey. *Journal of International Financial Management and Accounting* 10 (3): 153–187.

———, G. Hayt, and R. Marston. 1998. Wharton survey of financial risk management by US non-financial firms. *Financial Management* 27 (Winter): 70–91.

Bomfim, A. 2003. Counterparty credit risk in interest rate swaps during times of market stress. Finance and Economics Discussion Series (FEDS) Working Paper 2003-09. March. Washington, D.C.: Federal Reserve Board.

Brenner, L., D. Koehler, and A. Tversky. 1996. On the evaluation of one-sided evidence. *Journal of Behavioral Decision Making* 9 (March): 59–70.

Buffett, W. 2003. Avoiding a "mega-catastrophe." *Fortune* (March 17): 82–87.

Cooper, I., and A. Mello. 1991. The default risk on swaps. *The Journal of Finance* 46 (June): 597–620.

Dietrich, R., S. Kachelmeier, D. Kleinmuntz, and T. Linsmeier. 2001. Market efficiency, bounded rationality, and supplemental business reporting disclosures. *Journal of Accounting Research* 39 (September): 243–268.

Duffie, D., and M. Huang. 1996. Swap rates and credit quality. *The Journal of Finance* 51 (July): 921–949.

Financial Accounting Standards Board (FASB). 1990. *Employers' Accounting for Postretirement Benefits Other Than Pensions*. Statement of Financial Accounting Standards No. 106. Norwalk, CT: FASB.

———. 1998. *Accounting for Derivative Instruments and Hedging Activities*. Statement of Financial Accounting Standards No. 133. Norwalk, CT: FASB.

———. 2000. *Accounting for Transfers and Servicing of Financial Assets and Extinguishments of Liabilities (a replacement of FASB Statement 125)*. Statement of Financial Accounting Standards No. 140. Norwalk, CT: FASB.

Folkes, V. 1988. The availability heuristic and perceived risk. *Journal of Consumer Research* 15 (June): 13–23.

Fox, C., B. Rogers, and A. Tversky. 1996. Options traders exhibit subadditive decision weights. *Journal of Risk and Uncertainty* 13 (July): 5–17.

Ganguly, A., J. Kagel, and D. Moser. 1994. The effects of biases in probability judgments in asset markets: An experimental investigation of the base rate fallacy. *Accounting, Organizations and Society* 19 (November): 675–700.

Guay, W. 1999. The impact of derivatives on firm risk: An empirical examination of new derivative users. *Journal of Accounting and Economics* 26 (January): 319–351.

———, D. Haushalter, and B. Minton. 2003. The influence of corporate risk exposures on the accuracy of earnings forecasts. Working paper, University of Pennsylvania.

Hilzenrath, D. 2003. Complex instruments pose financial risks for Fannie, Freddie. *Washington Post* (November 17): E12.

Hobson, J., and S. Kachelmeier. 2005. Strategic disclosure of risky prospects: A laboratory experiment. *The Accounting Review* 80 (July): 825–846.

Hodder, L., L. Koonce, and M. McAnally. 2001. SEC market risk disclosures: Implications for judgment and decision making. *Accounting Horizons* 15 (March): 49–70.

Holland, K., and W. Glasgall. 1994. A black hole in the balance sheet: A spate of big losses from derivatives sparks a call for disclosure. *BusinessWeek* (May 16): 81.

Hopkins, P. 1996. The effect of financial statement classification of hybrid financial instruments on financial analysts' stock price judgments. *Journal of Accounting Research* (Supplement): 33–50.

Hsee, C. 1996. The evaluability hypothesis: An explanation for preference reversals between joint and separate evaluations of alternatives. *Organizational Behavior and Human Decision Processes* 67 (September): 247–257.

Huge, B., and D. Lando. 1999. Swap pricing with two-sided default risk in a rating-based model. *European Finance Review* 3: 239–268.

Judd, C., G. McClelland, and S. Culhane. 1995. Data analysis: Continuing issues in the everyday analysis of psychological data. *Annual Review of Psychology* 46: 433–465.

Kahneman, D., and A. Tversky. 1973. On the psychology of prediction. *Psychological Review* 80 (July): 237–251.

———, and ———. 1979. Prospect theory: An analysis of decision under risk. *Econometrica* 47 (March): 263–291.

Kennedy, J., T. Mitchell, and S. Sefcik. 1998. Disclosure of contingent environmental liabilities: Some unintended consequences? *Journal of Accounting Research* 36 (Autumn): 257–277.

Kleinbaum, D., L. Kupper, and H. Morgensten. 1982. *Epidemiologic Research: Principles and Quantitative Methods*. Belmont, CA: Lifetime Learning Publications.

Kolb, R. 1999. *Futures, Options, and Swaps*. Malden, MA: Blackwell Publishers.

Koonce, L., M. McAnally, and M. Mercer. 2005. How do investors judge the risk of derivative and non-derivative financial items? *The Accounting Review* 80 (January): 221–241.

Kraus, A., and R. Litzenberger. 1976. Skewness preference and the valuation of risk assets. *Journal of Finance* 31 (September): 1085–1100.

Kuprianov, A. 1994. The role of interest rate swaps in corporate finance. *Economic Quarterly* 80 (Summer): 49–68.

Levin, I., R. Johnson, C. Russo, and P. Deldin. 1985. Framing effects in judgment tasks with varying amounts of information. *Organizational Behavior and Human Decision Processes* 36 (December): 362–377.

———, and G. Gaeth. 1988. How consumers are affected by the framing of attribute information before and after consuming the product. *Journal of Consumer Research* 15 (December): 374–378.

Libby, R., R. Bloomfield, and M. Nelson. 2002. Experimental research in financial accounting. *Accounting, Organizations and Society* 27 (November): 777–812.

Litzenberger, R. 1992. Swaps: Plain and fanciful. *Journal of Finance* 42 (July): 831–850.

Loewenstein, G., E. Weber, C. Hsee, and E. Welch. 2001. Risk as feelings. *Psychological Bulletin* 127 (March): 267–286.

Loomis, C. 1995. Untangling the derivatives mess. *Fortune* (March 20): 50–68.

Louis, J. 1997. Commodity users struggle with disclosure. *Derivatives Strategy Magazine* (June). Available at: http://derivativesstrategy.com/.

Luce, D., and E. Weber. 1986. An axiomatic theory of conjoint, expected risk. *Journal of Mathematical Psychology* 30 (June): 188–205.

Markowitz, H. 1952. Portfolio selection. *Journal of Finance* 7 (March): 77–91.

———. 1991. Foundations of portfolio theory. *Journal of Finance* 46 (June): 469–477.

Mayo, M. 2002. Accounting risk at banks. Prudential Financial Conference Call Transcript. February 1. New York, NY: Prudential Securities Incorporated.

Moser, D. 1989. The effects of output interference, availability, and accounting information on investors' predictive judgments. *The Accounting Review* 64 (July): 433–448.

Petersen, M., and S. Thiagarajan. 2000. Risk measurement and hedging: With and without derivatives. *Financial Management* 29 (Winter): 5–30.

Roulstone, D. 1999. Effect of SEC Financial Reporting Release No. 48 on derivative and market risk disclosures. *Accounting Horizons* 13 (December): 343–363.

Ryan, S. 1997. A survey of research relating accounting numbers to systematic equity risk, with implications for risk disclosure policy and future research. *Accounting Horizons* 11 (June): 82–95.

Schoemaker, P. 1980. *Experiments on Decisions Under Risk: The Expected Utility Hypothesis.* Hingham, MA: Martinus Nijhoff Publishing.

Schrand, C., and J. Elliott. 1998. Risk and financial reporting: A summary of the discussion at the 1997 AAA/FASB conference. *Accounting Horizons* 12 (September): 271–282.

Securities and Exchange Commission (SEC). 1997. *Disclosure of Accounting Policies for Derivative Financial Instruments, and Derivative Commodity Instruments and Disclosure of Quantitative and Qualitative Information About Market Risk Inherent in Derivative Financial Instruments, Other Financial Instruments, and Derivative Commodity Instruments.* Release Nos. 33-7386; 34-38223; IC-22487; FR 48; International Series No. 1047; File No. 27-35-95. Washington, D.C.: Securities and Exchange Commission.

Simon, H., and J. Hayes. 1976. The understanding process: Problem isomorphs. *Cognitive Psychology* 8 (April): 165–190.

Slovic, P. 1967. The relative influence of probabilities and payoffs upon perceived risk of a gamble. *Psychonomic Science* 9 (October): 223–224.

———, P., B. Fischoff, and S. Lichtenstein. 1982. Facts versus fears: Understanding perceived risk. In *Judgments Under Uncertainty: Heuristics and Biases*, edited by D. Kahneman, P. Slovic, and A. Tversky. Cambridge, U.K.: Cambridge University Press.

Sorenson, E., and T. Bollier. 1994. Pricing swap default risk. *Financial Analysts Journal* 50 (May/June): 23–33.

Timmons, H. 2001. Derivatives danger? *BusinessWeek* (November 12): 108.

Tversky, A., and D. Kahneman. 1973. Availability: A heuristic for judging frequency and probability. *Cognitive Psychology* 5 (September): 207–232.

von Neumann, J., and O. Morgenstern. 1947. *Theory of Games and Economic Behavior.* 2nd edition. Princeton, NJ: Princeton University Press.

Weber, E., and W. Bottom. 1989. Axiomatic measures of perceived risk: Some tests and extensions. *Journal of Behavioral Decision Making* 2 (April–June): 113–131.

———, and ———. 1990. An empirical evaluation of the transitivity, monotonicity, accounting, and conjoint axioms for perceived risk. *Organizational Behavior and Human Decision Processes* 45 (April): 253–275.

Wong, M. H. 2000. The association between SFAS No. 199 derivatives disclosures and the foreign exchange risk exposure of manufacturing firms. *Journal of Accounting Research* 38 (Autumn): 387–417.

THE ACCOUNTING REVIEW
Vol. 80, No. 3
2005
pp. 897–920

The Effect of Quantitative Materiality Approach on Auditors' Adjustment Decisions

Mark W. Nelson
Cornell University

Steven D. Smith
University of Illinois at Urbana–Champaign

Zoe-Vonna Palmrose
University of Southern California

ABSTRACT: Two alternative approaches are used in audit practice to provide quantitative materiality assessments about proposed audit adjustments. The *cumulative* approach compares to net income the total amount of misstatement existing at the end of the current period, while the *current-period* approach compares to net income the amount of misstatement added in the current period. Depending on the relation between total misstatement and current-period misstatement, either the cumulative approach or the current-period approach can calculate higher quantitative materiality. This paper reports an experiment that varies materiality approach between auditors by providing auditors with either the current-period or cumulative formats used by their firm to summarize proposed audit adjustments. Results indicate that, across a variety of experimental contexts (varying misstatement size, subjectivity, precision, and income effect, and varying whether auditors document effects on their client's quality of earnings), auditors are more likely to require their client to book the misstatement under the approach that makes the misstatement appear more material. These results suggest that standard setters mandate that auditors require adjustment whenever a misstatement is material under either approach.

Keywords: *materiality; auditing; adjusting entries; iron curtain; rollover; earnings management.*

Data Availability: *Contact the authors.*

We are grateful for comments from Rob Bloomfield, Shana Clor, Jon Davis, Tom Dyckman, Karla Johnstone, Chris Jones, Bill Kinney, Bob Libby, Sue Ravenscroft, Dave Ricchiute, Lisa Sedor, Robin Tarpley, Sandra Vera-Muñoz, two reviewers, and workshop participants at the 2003 AAA Doctoral Consortium, Cornell University, The George Washington University, Iowa State University, The Ohio State University, Syracuse University, and the Universities of Notre Dame, Pennsylvania, Toronto, and Wisconsin. We also are grateful for financial support provided by Cornell University, the University of Illinois, and the University of Southern California, and for participation by audit partners and managers from one Big 4 accounting firm.

Editor's note: This paper was accepted by Jane Kennedy, Editor.

Submitted June 2003
Accepted November 2004

I. INTRODUCTION

Two alternative approaches are used in audit practice to provide quantitative materiality assessments about proposed audit adjustments.[1] The *cumulative* approach compares to net income the total amount of misstatement existing at the end of the current period (i.e., the amount necessary to correct the balance sheet), while the *current-period* approach compares to net income the amount of new misstatement added in the current period.[2] As illustrated in the Appendix, either approach can make the assessment appear more material quantitatively, depending on the relation between total misstatement and current-period misstatement. Therefore, SEC personnel (Taub 2004; Turner 2000) and an SEC advisory panel (Panel on Audit Effectiveness 2000) have indicated concern that materiality approach could affect auditors' adjustment decisions and therefore affect the amount of misstatement present in audited financial statements.

Our study provides descriptive evidence with respect to this concern by reporting the results of an experiment in which 234 audit partners and managers determined, for eight cases, whether the final outcome of an audit will be to book or waive a proposed adjusting journal entry. All participants are employed by a single Big 4 firm at which a choice is made upon client acceptance to use either the current-period or cumulative approach; therefore, for each of the eight cases, all aspects of the audit firm, the client, the misstatement, and the proposed audit adjustment are held constant. Across cases we manipulate qualitative and quantitative misstatement characteristics that prior research has indicated may affect materiality judgments and adjustment decisions. Between auditors we manipulate materiality approach by varying whether auditors receive the current-period or cumulative formats used at their firm to summarize proposed audit adjustments. We also manipulate between auditors whether auditors are required to document effects of waiving the misstatement on current and future quality of earnings.

We find waive rates ranging from 82 percent to 17 percent across the materiality approaches and the cases used in our experiment. These waive rates should not be viewed as indicative of actual waive rates in practice, given the abstraction inherent in experimentation. However, our cases were pilot-tested extensively and duplicate exactly the scoresheets used by the participants' firm to evaluate audit adjustments. Therefore, because our data collection occurred in Autumn 2002, we view these results as providing evidence that auditors are willing to waive adjustments under at least some circumstances in the reporting climate subsequent to passage of the Sarbanes-Oxley Act, despite concerns about aggressive reporting and the potential for earnings management.

Our results indicate that, holding constant the actual misstatement in the financial statements, the proposed audit adjustment, all client characteristics, and all audit firm characteristics, auditors are less likely to require clients to book adjustments under whatever approach makes the misstatement appear to have lower quantitative materiality. These results are robust, being at least marginally significant for seven of eight cases. Materiality approach affects adjustment decisions regardless of misstatement subjectivity, the directional effect of the misstatement on net income, and the presence of a requirement to document the effect of waiving an adjustment on the client's quality of earnings. Materiality approach influences adjustment decisions regardless of whether approach causes the quantitative materiality associated with a particular misstatement to exceed the 5-percent-of-net-income threshold used as a screen by the auditors' firm. Also, materiality approach influences adjustment decisions regardless of whether auditors state that they believe that approach influences their adjustment decisions, indicating results cannot be attributed to the conscious application of a materiality policy. Thus, even though auditors have available all information necessary to consider a misstatement from the perspective of both materiality approaches, the approach presented to them affects their adjustment decisions persistently and in ways the auditors themselves do not realize.

---

[1] As used in this paper, "quantitative materiality assessments" and "quantitative materiality levels" refer to the quantitative materiality of a particular misstatement, rather than to a materiality threshold that the firm uses to delineate material and immaterial amounts.

[2] In practice, the "current-period" approach is often referred to as the "rollover" approach, since the effects of prior-period errors are "rolled over" to offset current-period errors and determine the net additional misstatement added in the current period. In practice, the cumulative approach is often referred to as the "iron curtain" approach, since no such offsetting is allowed (Taub 2004; Panel on Audit Effectiveness 2000).

Our results also indicate that the extent to which approach affects adjustment decisions depends in part on two of the qualitative materiality factors identified by SAB No. 99: misstatement subjectivity and misstatement precision. Regarding misstatement subjectivity, its strongest effect occurs in those cases for which materiality approach creates a large difference in quantitative materiality, with auditors more (less) likely to waive large (small) subjective misstatements than objective misstatements. Thus, although misstatement subjectivity is among the qualitative materiality characteristics highlighted by SAB No. 99, our results suggest that, in at least some circumstances, consideration of that characteristic can *reduce* the likelihood that a misstatement is adjusted.

Regarding estimate precision, our results indicate a significant effect of approach when a misstatement is defined as a point estimate, but an insignificant effect of approach when the same misstatement is defined as the lower bound of a range of possible misstatements. FIN No. 14 (FASB 1976) requires that such point- and range-defined misstatements be accounted for equivalently, but our results indicate that auditors still consider the possibility that the actual amount of misstatement exceeds the amount that financial accounting rules would require be booked. These results suggest a conservative response to imprecision that is consistent with SAB No. 99, and are similar to Kennedy et al.'s (1998) results involving financial statement users' responses to SFAS No. 5 disclosures.

Overall, we believe our results suggest potential differences between the amounts of post-audit misstatement existing in the financial statements of companies audited under different materiality approaches. One possible remedy being considered currently by the SEC is to require disclosure of materiality approach along with other key accounting choices in the "significant accounting policies" section of financial statement footnotes (Taub 2004). However, this remedy would be of limited usefulness if users lack the information necessary to understand the implications of a particular approach for the audit adjustments waived by auditors of their company. Standard setters might instead consider mandating that auditor communications with audit committees include the materiality approach applied on the engagement and the implications of this application. The SEC has encouraged such communications (Turner 2000), but not required them. Another remedy would be for standard setters to mandate use of only one materiality approach on all audits. However, given that there are some contexts in which either the cumulative or the current-period approach provides the higher quantitative materiality, it is unclear which approach standard setters should mandate. Instead, we believe standard setters should mandate that auditors apply both approaches and only waive adjustments that are immaterial under both approaches.

In the rest of this paper, Section II provides background on professional standards and relevant research. Section III describes method, and Section IV provides results. Section V provides a summary and discussion of implications.

II. BACKGROUND

In this section, we first discuss professional standards relevant to materiality, and then describe how our study builds upon prior academic research that examines materiality judgments and various additional factors that may influence auditors' decisions about whether to waive proposed audit adjustments.

Professional Standards Relevant to Materiality

In Concept Statement No. 2, the Financial Accounting Standards Board (FASB 1980) identified materiality as one of the fundamental qualitative characteristics of accounting information, and recognized that "those who make accounting decisions and those who make judgments as auditors continually confront the need to make judgments about materiality" (CON No. 2, para. 123). The auditor's opinion states whether the financial statements are "presented fairly, in all material respects" in conformity with generally accepted accounting principles.

Standard setters have not promulgated quantitative materiality guides, methods, or criteria that preparers could look to for authoritative support, instead opting to discuss qualitative and quantitative materiality considerations.[3] Although quantitative thresholds such as 5–10 percent of net income have long been used in practice (Pattillo 1976), the U.S. Supreme Court ruled in *TSC v. Northway* (426 U.S. 438, 449) that materiality should be determined with respect to the "total mix" of available information, and recent guidance from the SEC (SAB No. 99) and ASB (AU Sec. 312) emphasizes the importance of both qualitative and quantitative materiality dimensions. As indicated in SAB No. 99, "Quantifying, in percentage terms, the magnitude of a misstatement is only the beginning of an analysis of materiality; it cannot appropriately be used as a substitute for a full analysis of all relevant considerations" (SEC 1999, 2).

No accounting or auditing standards address directly the appropriateness of the cumulative and current-period approaches. Statement of Auditing Standards (SAS) No. 47 (AICPA 1984) implicitly permits both approaches by labeling the consideration of previously waived misstatements as an accounting choice that is not addressed in the Statement (footnote to para. 30). Yet, there are no accounting standards that deal with this choice. Also, unlike other important accounting choices, there exists no requirement for either issuers or auditors to disclose externally which approach is applied, and we are unaware of any instances of issuers or auditors voluntarily doing so. The Panel on Audit Effectiveness (2000) reported that both approaches are used in practice, and concluded that permitting both approaches is "potentially confusing." Therefore, the Panel recommended that standard setters specify only one approach for handling prior-period uncorrected misstatements when determining whether proposed adjustments are material (Panel on Audit Effectiveness 2000, para. 2.177). SEC personnel have expressed a preference for the cumulative approach in prior speeches (Turner 2000), and have indicated intention by the SEC to revisit the issue of materiality approach (Taub 2004), but no SEC guidance has yet been provided.

---

[3] For examples of such discussions, see the FASB's CON No. 2 (para. 131), the Securities Exchange Commission's Staff Accounting Bulletin (SAB) No. 99 (SEC 1999), and Auditing Standards Board's (ASB's) *Interpretations of AU Section 312, Audit Risk and Materiality* (AICPA 2000b).

Research Related to Materiality Approach

A large archival and experimental literature has examined the extent to which auditors' materiality judgments appear to reflect consideration of various income statement and balance sheet numbers (for reviews, see Moriarity and Barron 1976; Holstrum and Messier 1982; Morris and Nichols 1988). In general, this literature highlights the importance of misstatement amount relative to net income as a determinant of materiality, with additional evidence that materiality decisions are affected by misstatement amount relative to gross or net assets. These studies do not address the effects of cumulative versus current-period approach on the amount of misstatement that is considered; rather, they examine the effects of various materiality bases against which a given amount of misstatement could be compared.

One way to view materiality approaches is that they are alternative methods for aiding the auditor when making quantitative materiality judgments. Given prior evidence that auditors face information-processing limitations associated with information recall and aggregation (see, e.g., Bonner et al. 1996), auditor judgment might be affected by alternative approaches that differ in the extent to which prior-period information is offset against current-period information. The current-period approach automatically offsets prior-period waived misstatements with current-period misstatements before computing quantitative materiality, potentially making it difficult for auditors to focus on cumulative effects by requiring auditors to back out any offset amounts. The cumulative approach does not automatically offset prior-period and current-period amounts, potentially making it difficult for auditors to focus on offsetting amounts by requiring auditors to recall prior-period waived misstatements and offset them with current-period misstatements.

This decision-aid perspective also highlights that an effect of materiality approach on adjustment decisions is not assured. Numerous studies provide evidence that auditors circumvent various decision aids if they see it as in their best interests to do so (Eining et al. 1997). For example, auditors may "work backward" from some intended conclusion to determine the inputs necessary to justify their preferred conclusion (e.g., Kachelmeier and Messier 1990; Messier et al. 2001), or may shift their judgments away from those recommended by an aid because of a preference for outcomes different from those indicated by the aid (e.g., Ashton 1990; Boatsman et al. 1997). More generally, research suggests that auditors make decisions largely consistent with their incentives when governed by subjective criteria like materiality. (See Nelson [2004] for a review and Libby and Kinney [2000] for recent evidence.)

We test whether current-period and cumulative approaches influence auditors' decisions about whether to waive adjustment of a detected misstatement. We predict that, holding constant all aspects of prior-period and current-period misstatements, financial statements, company, etc., auditors are more likely to require adjustment under the approach that makes the misstatement appear most material quantitatively. To provide evidence about whether effects of materiality approach are conscious, we ask auditors during debriefing whether they believe materiality approach influences their decisions.

Research Concerning Other Factors Relevant to Materiality Assessments

Examining the effect of materiality approach in multiple circumstances allows us to assess the robustness of its effect, and also allows us to contribute to the literature that examines how various qualitative and quantitative materiality factors affect adjustment decisions. Therefore, we vary misstatement size, subjectivity, income effect, and precision between cases, and also vary between auditors whether auditors are required to document the effect of a misstatement on their client's quality of earnings.

Misstatement Size

Misstatement size represents a key element of materiality, and research indicates that auditors are more likely to waive smaller adjustments (Braun 2001; Houghton and Fogarty 1991; Icerman and Hillison 1991; Wright and Wright 1997). However, this research was conducted in the 1990s and before, and therefore it reflects adjustment decisions made prior to the arguably more conservative financial-reporting climate that has emerged following recent scandals, regulatory activity, and the demise of Andersen. For example, the SEC's recently issued SAB No. 99 discourages registrants and auditors from relying on a heuristic such as the "5 percent rule" for determining materiality, and generally encourages auditors to use more stringent quantitative and qualitative materiality guidelines.

It is unclear how misstatement size interacts with materiality approach. Materiality approach may matter more when misstatements are of less than 5 percent materiality, because auditors in the post-Sarbanes-Oxley environment may adjust all misstatements that could be viewed as greater than 5 percent under any approach. Alternatively, materiality approach may matter more if it determines whether a misstatement exceeds the 5 percent threshold, because that threshold continues to be an important determinant in auditors' adjustment decisions. Therefore, we compare the effect of materiality approach between large and small adjustments.

Misstatement Subjectivity

Misstatements can differ in the extent to which they involve judgment. For example, a cutoff error typically is objectively verifiable, whereas a reserve adjustment typically involves subjective assessment. SAB No. 99 includes "whether a misstatement arises from an estimate" among the qualitative materiality dimensions that auditors should consider. Several studies provide evidence that auditors are less likely to require adjustment when amounts are subjective (e.g., Wright and Wright 1997; Braun 2001; Nelson 2003). However, Libby and Kinney (2000) find that auditors are willing to waive adjustment of both objective and subjective amounts when amounts are small quantitatively (but material qualitatively), suggesting that subjectivity, and possibly materiality approach, might matter primarily when misstatements are of larger size. Therefore, we assess the generality of the effects of materiality approach by examining decisions with respect to misstatements that vary in their objectivity (cutoff misstatements versus reserve misstatements) as well as size (small versus large).

Current-Year Income Effect

Auditors' risk of litigation is highest for overstatements of current income and equity (St. Pierre and Anderson 1984; Carcello and Palmrose 1994), and auditing texts encourage auditors to focus on detecting overstatements of current-year net income and equity (e.g., Arens and Loebbecke 1997). Prior studies have demonstrated that auditors tend to propose more income-decreasing adjustments (Kinney and Martin 1994), and are more likely to require that clients book income-decreasing adjustments (Braun 2001; Nelson et al. 2002), particularly when the adjustments are large (Wright and Wright 1997). Given the robustness of these effects, it may be that income-decreasing (income-increasing) adjustments are rarely (typically) waived, such that materiality approach has little effect. Therefore, we compare the effect of materiality approach between income-increasing and income-decreasing adjustments.

Adjustment Precision

FASB Interpretation No. 14 provides guidance about SFAS No. 5 implementation, and indicates that, if a range of contingent-liability amounts is equally likely, the low end of the range should be accrued. Thus, GAAP accrual requirements make no distinction between a point estimate and the low endpoint of a range. Yet, SAB No. 99 includes "the degree of imprecision inherent in an estimate" among the qualitative materiality dimensions that auditors should consider. Consistent with this conjecture, Kennedy et al. (1998) find that various financial statement users respond to range-defined contingencies by projecting a higher expected loss than they do when presented with only the lower bound of the range, and Newton (1977) finds that auditors' utility curves typically exhibit risk aversion with respect to materiality judgments. However, no research has investigated whether auditors' adjustment decisions are affected by whether the misstatement is point- versus range-defined.

We believe the existence of a range of higher possible outcomes suggests additional uncertainty about misstatement size that will render auditors less likely to waive an adjustment. In those circumstances, materiality approach may have little effect. Therefore, we compare the effect of materiality approach between point estimates and ranges, holding constant the amount of adjustment proposed.

Quality of Earnings

Libby and Kinney (2000) provide evidence that SAS No. 89's (AICPA 1999) requirement that auditors report waived adjustments to their clients' audit committees has no effect on auditors' adjustment decisions with respect to qualitatively material adjustments. As a result, Libby and Kinney (2000, 385) conclude that "SAS No. 89 is unlikely to eliminate ... opportunistic correction of quantitatively immaterial misstatements to manage earnings to forecasts."

We provide a somewhat similar test with respect to SAS No. 90 (AICPA 2000a), which requires that auditors report to the audit committee about client's quality of earnings. One possible outcome of the SAS No. 90 reporting requirement is that auditors consider more carefully the effect of waiving audit adjustments on their client's current and future quality of earnings. However, this reporting requirement may lack sufficient immediacy to influence auditors' adjustment decisions. Given that SAS No. 90 has been in effect since 2000, we cannot manipulate its existence as did Libby and Kinney (2000) with respect to SAS No. 89, but we can investigate the effects of a more salient intervention, which prompts auditors to document quality-of-earnings effects prior to making an adjustment decision. To the extent that a quality-of-earnings prompt reduces auditors' willingness to waive audit adjustments, it should also reduce the effect of audit approach on adjustment decisions. Therefore, we examine whether the effects of audit approach depend on providing auditors with a prompt to document the effects of waiving an adjustment on current and future quality of earnings.

III. METHOD

Overview and Design

In our experiment, auditors from one Big 4 audit firm determine, for eight cases, whether the final outcome with respect to a proposed audit adjustment would be to waive the adjustment or require that it be booked. The experiment requires participants to read background information, complete the eight cases (each of which has them determine disposition of an audit adjustment for the client described in the background information), and complete a short debriefing questionnaire. Most participants completed the experiment in 40 minutes; none exceeded one hour.

The experiment has a 2 × 2 × 8 mixed design, with materiality approach (current-period versus cumulative) and Q of E (prompted versus not prompted to consider quality-of-earnings implications of the client's preferred accounting treatment) manipulated between participants, and case (1–8) manipulated within participants.

Participants and Administration

The experiment requires relatively experienced auditors as participants, given that it involves decisions about disposition of audit adjustments. Materials were pilot-tested with four audit managers, and 234 auditors participated in the experiment (57 audit partners with an average of 21 years of experience; 177 audit managers with an average of 8.3 years of experience).

All participants are employed by a single Big 4 firm at which a choice is made upon client acceptance to use *either* the current-period *or* cumulative approach. This initial choice determines the format of the scoresheet used in future periods to accumulate proposed audit adjustments; it does not affect the amount of audit adjustments proposed, but does affect the quantitative materiality assessment listed on the scoresheet. Auditors at this firm must obtain permission before waiving adjustment of any misstatements that exceed 5 percent of net income under the chosen approach. However, auditors retain significant latitude with respect to their waive decisions, because (1) they never need permission to require a client to book an adjustment, (2) they never need permission to waive adjustment of misstatements that are less than 5 percent of net income under the chosen materiality approach, and (3) they may be able to get permission to waive adjustments of greater than 5 percent of net income under the chosen materiality approach.

The experiment was administered in six general partner or manager training sessions conducted by the participants' firm during Autumn 2002. The first training session included only partner participants; subsequent sessions included only manager participants.[4] Any significant effects of session are discussed in the "Results" section.

Cases

The first page of each case described a prior-year waived audit adjustment (or stated that none existed), and required participants to identify the direction and amount of the income-effect of the prior-year adjustment. Thus, regardless of the materiality approach to which they had been assigned, all auditors confirmed their understanding of prior-year waived adjustments before making current-year judgments. The second page of each case was a fold-out spreadsheet that exactly replicated the scoresheet format (either current-period approach or cumulative approach) used by the audit firm to record audit adjustments proposed for the current year.

Dependent Variable

Participants recorded their responses in the lower right-hand portion of the scoresheet. All participants answered two questions. Responses to the first question became our primary dependent variable. The question was: With respect to this specific case, the eventual outcome in the audit would be (circle one answer):

---

[4] Materials were identical in all sessions, except that after the first session we clarified wording and modified a number in one case to strengthen a manipulation. In Section IV we describe this modification in more detail and consider how it affects our interpretation of results.

A. No adjustment of the client's 2002 accounting treatment.
B. Partial adjustment of the client's 2002 accounting treatment; amount of adjustment = $________.
C. Total adjustment of the client's 2002 accounting treatment.

For purposes of our analyses, the B and C responses are collapsed to yield a binary "adjust/don't adjust" dependent variable.

Consistent with Libby and Kinney (2000), Ng and Tan (2002), Nelson et al. (2002), and Nelson (2003), we elicited judgments about final outcome of the audit. Final outcome is the dependent variable of most practical concern, as it determines any effect on the audited financial statements. Also, while audit managers may not be directly involved in auditor/client negotiations about whether audit adjustments must be booked by their client, they are involved in proposing adjustments as an input to negotiations and in booking those adjustments that are required as an outcome of any auditor/client negotiation, so an outcome-focused dependent variable ensured that both managers and partners could provide useful data.

To clarify the fiscal year being adjusted, participants also answered the following question: Any amount of adjustment I would require would be recorded as a (circle one answer):

A. Adjustment in 2002.
B. Prior-period adjustment of 2001.

Independent Variables

Materiality Approach

The background information included a description of the materiality approach (current-period or cumulative) to which participants had been assigned. We adapted these descriptions, shown in Figure 1, from the audit manual provided by the participants' firm, clarifying some wording and ensuring that the descriptions were of approximately the same length.

We manipulated materiality approach by varying whether the scoresheet accompanying each case used the firm's current-period or cumulative approach. Regardless of approach, the scoresheet always used a single format to identify the proposed audit adjustment (including journal entry and explanation), as well as the before-tax effect of the proposed adjustment on the balance sheet, income statement, comprehensive income, and cash flows. Depending on whether the current-period or cumulative approach was used, the scoresheet either did or did not offset the before-tax income effect of the adjustments with prior year "rolled over" adjustments before listing a final before-tax and after-tax amount of adjustment and comparing the adjustment on a percentage basis to before-tax and after-tax net income.

Quality-of-Earnings Prompt

Participants assigned to the "quality-of-earnings prompt" condition were provided with the following instruction, placed on the scoresheet immediately above the area where participants made their adjustment decisions: "Write one or two short sentences that document your belief about how the client's original 2002 accounting treatment, if not adjusted, would affect the client's QUALITY OF EARNINGS in current and future periods." Participants wrote their responses on blank lines on the scoresheet.

Case Attributes

As shown in Table 1, the eight cases varied in terms of the prior-year waived adjustment and current-year proposed adjustment in order to manipulate (1) the materiality approach

FIGURE 1
Descriptions of Materiality Approach Included in Instructions

Current-Period Approach (Called the "Rollover Method" in Practice)
The rollover method recognizes that unadjusted differences identified in the previous year that were not corrected may reverse in the current period, and that certain other differences have a continuing, but probably offsetting, effect in future periods. Therefore, under the rollover method, the effect of each waived adjustment on the prior year's (scoresheet)[a] should be evaluated separately to determine if it is appropriate to "roll over" its effect to the current year's (scoresheet). The impact of "rolled over" adjustments from the prior year's (scoresheet) is netted against the impact of proposed adjustments on the current year's (scoresheet) to assess the materiality of current-year unadjusted differences to net income and comprehensive income.

Cumulative Approach (Called the "Iron-Curtain Method" in Practice)
The iron-curtain method recognizes that current-year proposed adjustments capture the cumulative effect of adjustments waived on the prior year's (scoresheet) as well as the effect of adjustments arising in the current year. Therefore, under the iron-curtain method, waived adjustments on the prior year's (scoresheet) are not relevant to considering adjustments proposed on the current year's (scoresheet). Only the impact of proposed adjustments on the current-year (scoresheet) is considered when determining the materiality of current-year unadjusted differences to net income and comprehensive income.

---

[a] Participants saw the firm's actual scoresheet name wherever "(scoresheet)" appears in the figure.

providing the higher quantitative materiality (current-period or cumulative higher), (2) level of adjustment materiality when viewed from the higher materiality approach (hereafter "size" from greater than 5 percent materiality down to 2.35 percent materiality), (3) misstatement subjectivity (objective cutoff errors versus subjective bad-debts reserves), (4) misstatement income effect (income increasing versus income decreasing), and (5) misstatement precision (proposed adjustment based on a point estimate versus the low end of a range of possible values). Because of concerns about time available during the data-collection sessions, we did not fully cross all case dimensions, but rather developed the cases to enable particular comparisons. Specific comparisons and cases are discussed in the "Results" section.

Cases appeared in 15 different orders. Five cases involved a bad debts reserve and three involved a cutoff error. Therefore, to reduce potential confusion of cases and carryover effects, each order of cases began with a bad-debts case, alternated bad-debts and cutoff cases, and ended with two bad-debts cases, with the case providing range information always appearing last to avoid contaminating other cases with range considerations. Subject to those constraints, orders were balanced. Order is not significant when included as a variable in any analysis.

Instructions

Participants were provided a hard copy of all instructions. Participants started the experiment by reading along while a researcher read aloud a letter from a well-known senior partner requesting their participation in the experiment. The letter stated that the firm worked with the researchers to ensure that the cases included all necessary information, that the anonymity of the auditors, the firm, and of all the firm's audit clients was assured, and concluded with: "Therefore, although I realize that these sorts of judgments are of a sensitive nature, I ask that you act as you would on an actual client engagement when

TABLE 1
Description of Cases

	Case A: Recurring Cutoff Error	Case B: Recurring Cutoff Error	Case C: Reversing Cutoff Error	Case D: Reduce Reserve	Case E: Reduce Reserve	Case F: Overstating Reserve	Case G: Understating Reserve	Case H: Understating Reserve (Range)
Identification of higher-materiality approach								
Prior year waived adjustment: Effect on prior pre-tax NI	Late cutoff: $8.9 increase	Late cutoff: $3.5 increase	Early cutoff: $5.45 decrease	Overstated reserve: $9.8 decrease	Overstated reserve: $5.5 decrease	Overstated reserve: $7.0 decrease	Understated reserve: $6.75 increase	Understated reserve: $6.60 increase
Current year waived adjustment: Effect on current pre-tax NI	Late cutoff: $9.0 increase	Late cutoff: $4.0 increase	Late cutoff: $4.05 increase	Reduced reserve: $9.8 increase	Reduced reserve: $5.5 increase	Overstated reserve: $7.5 decrease	Understated reserve: $7.25 increase	Understated reserve: $7.10 increase
Materiality under current-period approach (% of pre-tax NI)	$0.1 increase (0.06%)	$0.5 increase (0.29%)	$9.5 increase (5.59%)	$9.8 increase (5.76%)	$5.5 increase (3.24%)	$0.5 decrease (0.29%)	$0.5 increase (0.29%)	$0.5 increase (0.29%)
Materiality under cumulative approach (% of pre-tax NI)	$9.0 increase (5.29%)	$4.0 increase (2.35%)	$4.05 increase (2.38%)	$0.0 (0%)	$0.0 (0%)	$7.5 decrease (4.41%)	$7.25 increase (4.26%)	$7.10 increase (4.18%)
Higher-materiality approach[a]	Cumulative	Cumulative	Current-period	Current-period	Current-period	Cumulative	Cumulative	Cumulative
Misstatement characteristics manipulated between cases								
Subjectivity[b]	Objective	Objective	Objective	Subjective	Subjective	Subjective	Subjective	Subjective
Highest quantitative materiality under either approach[b] (% of pre-tax NI)	High (5.29%)	Low (2.35%)	High (5.59%)	High (5.76%)	Low (3.24%)	Medium (4.41%)	Medium (4.26%)	Medium (4.18%)
Income effect[c]	Increase	Increase	Increase	Increase	Increase	Decrease	Increase	Increase
Precision of estimate[d]	Point	Point	Point	Point	Point	Point	Point	Range

---

[a] See Table 2 for analyses of the effect of materiality approach on auditors' adjustment decisions.
[b] See Table 3 for analyses of the effect of materiality approach, misstatement subjectivity, and misstatement size on auditors' adjustment decisions.
[c] See Table 4 for analyses of the effect of materiality approach and current-period income direction on auditors' adjustment decisions.
[d] See Table 5 for analyses of the effect of materiality approach and misstatement precision on auditors' adjustment decisions.

completing the case studies. The value of this research to the Firm depends on your providing responses that are as realistic as possible."

Participants next read instructions emphasizing that they would be provided with background information about a client and then be presented with eight independent case scenarios about the client. They were again told to put themselves in the position of an auditor who has to make this particular decision, as if their typical SEC client was facing this set of circumstances.

Background Information

We adapted background information from materials developed by Braun (2001) and Libby and Kinney (2000). Participants were provided with current year pre-audit balances of key income-statement and balance sheet accounts, adapted from Braun (2001) and based on medians for SIC code 75, "Auto Repair, Services, and Parking."

To portray a client of moderate risk that was near enough to important thresholds for audit adjustments to be of concern, the client, Capital Auto Parts, Inc. (hereafter CAP), was described as a medium-sized, SEC-listed client that has been profitable and growing for the prior five years, but with current year performance lagging prior-year performance. Participants were told that management and analysts foresee continued growth, but management remains very concerned about CAP's ability to generate performance that consistently meets analyst forecasts. SAB No. 99 explicitly lists changes in trends and meeting analyst forecasts as qualitative materiality dimensions, so this aspect of the background also ensures that all cases contain qualitative as well as quantitative materiality considerations.

To portray a client of at least moderate importance to the auditor, CAP was described as providing a large share of the audit office's work and fees, and as helping to maintain the office's profile and status among competing auditing firms.

To alleviate any concerns about the audit other than those identified in the materials, CAP's controls were described as adequate, and auditors were informed that all standard audit tests had been completed by competent staff and reviewed to the participant's satisfaction, resulting in the adjustments proposed.

To ensure that auditors perceived a need to consider waiving proposed adjustments, they were told: "The client is strongly pressuring you to waive the proposed adjustments. They feel that the financial statements are fairly presented as is and therefore are eager to release the unadjusted figures to the financial press as soon as possible. The client expressed this opinion so strongly that you believe there is a risk of losing the client if you insist that the financial statements be adjusted. At the same time, the client insists on receiving an unqualified opinion on the financial statements."

IV. RESULTS

Comprehension Checks

Analyses of debriefing questions indicate that participants understood the case materials. Participants correctly indicated that the client opposed the proposed audit adjustments (mean rating of 9.0 on a scale of 1 [slightly opposed] to 11 [extremely opposed]). Participants correctly indicated that the client was an important audit client (mean rating of 8.0 on a scale of 1 [not important] to 11 [extremely important]). Consistent with the manipulation of adjustment subjectivity via cases based on cutoff errors versus bad debts reserves, participants rated the subjectivity of cutoff errors at 2.3 and the subjectivity of bad debts reserves as 7.8 (on a scale of 1 [not subjective] to 11 [extremely subjective]). Consistent with the quality-of-earnings prompt encouraging participants to consider these issues, participants generally wrote clear and reasonable explanations of current and future effects of the misstatement on quality of earnings. Participants processed information about prior-year waived adjustments, with 98.0 percent answering comprehension checks correctly, and no difference in the percentage of correct answers between materiality approaches ($t = .12$, $p = 0.90$) or between cases. Only four participants answered more than two comprehension checks incorrectly. Results do not change with these participants omitted from analyses.

Overall Effect of Materiality Approach

To test for an overall effect of materiality approach, we identify for each case the approach that provides the higher assessment of the adjustment's quantitative materiality. Because each participant was assigned to either the current-period or cumulative treatment, a participant was in the treatment that showed higher quantitative materiality for some cases and lower quantitative materiality for other cases. For each subject and each case, we coded a variable, "perspective," with a 1 (0) if the subject was in the treatment that yielded the higher (lower) quantitative materiality for that particular case.

Table 2 shows for each case the difference in proportion of adjustments waived between the lower and higher quantitative materiality perspectives. For all eight cases, a higher proportion of adjustments were waived under the perspective that indicated lower quantitative materiality, and for seven of eight cases that difference is at least marginally significant.[5] To analyze all cases simultaneously, we performed a repeated-measures logistic regression with a dependent variable of adjust (coded as 1 if auditor adjusts and 0 if auditor does not adjust) and independent variables of perspective (higher or lower quantitative materiality) and session (session 1, containing only partners, versus sessions 2–6).[6] Results indicate no significant interactions and a significant main effect of perspective ($p = 0.0025$), indicating that participants were more likely to require adjustments under the approach that yielded the higher quantitative materiality.[7]

Results also indicate a significant main effect for session ($p = 0.0078$). However, this appears to be driven by the one case (Case C) for which we increased misstatement size between the first session and subsequent sessions.[8] When this case is omitted from this analysis, session becomes insignificant, suggesting that the session effect is driven primarily by auditors' unwillingness to waive adjustment of larger misstatements, rather than suggesting that results differ systematically between partners and managers.[9] Regardless, the

---

[5] We believe that one-sided tests are appropriate because these comparisons hold constant all aspects other than approach, and approach only varies the quantitative materiality associated with a misstatement. While we think it is possible for materiality approach to have no effect on adjustment decisions, we do not believe it reasonable to expect that auditors would be *less* likely to adjust misstatements that are larger quantitatively, holding constant all other aspects of the client, audit firm, and misstatement.

[6] Results are based on score statistics for Type 3 GEE Analysis using Proc GENMOD in SAS, version 8. P-values are computed based on the Chi-square distribution. In all analyses, case (or variables based on case, like size, subjectivity, income effect, and precision) is treated as a repeated measure to ensure test statistics are computed appropriately.

[7] Participants also identified whether any adjustments would be included in current-period earnings or shown as a prior period adjustment. For most cases, adjustments were all reflected in current-period earnings, with only between 5 percent and 11 percent of adjustments identified as prior-period adjustments. However, prior-period adjustments were required more frequently for cases involving reductions of "cookie-jar" reserves (56 percent of adjustments for "large reserve" Case D; 37 percent of adjustments for "small reserve" Case E).

[8] Based on informal feedback received after the first session, we increased the prior-year error size of Case C from $3.45 million to $5.45 million, which has the effect of increasing the materiality of the error when evaluated using a rollover approach. Thus, for this case "session" captures the joint effect of experience differences and the modification of error size.

[9] Case C is the only case whose omission renders the session main effect insignificant.

TABLE 2
Effect of Materiality Approach, by Case, on Percent Waived

Panel A: Difference in Proportion Waived between High-Materiality and Low-Materiality Approaches, By Case

	Case A: Recurring Cutoff Error	Case B: Recurring Cutoff Error	Case C: Reversing Cutoff Error	Case D: Reduce Reserve	Case E: Reduce Reserve	Case F: Overstating Reserve	Case G: Understating Reserve	Case H: Understating Reserve (Range)
Approach yielding highest materiality	Cumulative	Cumulative	Current-period	Current-period	Current-period	Cumulative	Cumulative	Cumulative
Percent of adjustments waived								
Current-period approach (n)	70% (n = 118)	75% (n = 118)	17% (n = 116)	48% (n = 118)	74% (n = 117)	59% (n = 116)	48% (n = 116)	34% (n = 117)
Cumulative approach (n)	23% (n = 114)	67% (n = 114)	35% (n = 113)	58% (n = 112)	82% (n = 111)	47% (n = 114)	39% (n = 113)	33% (n = 113)
%waived, low materiality approach less %waived, high materiality approach	47% ($p < 0.0001$)[a]	8% ($p < 0.07$)	18% ($p < 0.0009$)	10% ($p < 0.07$)	8% ($p < 0.08$)	12% ($p = 0.04$)	9% ($p = 0.08$)	1% (NS)

Panel B: Auditor Adjustment Decisions: Logit of High versus Low Materiality Perspective and Session (1 versus 2–6)

Source	Chi-Square	Pr > Chi-Square
Perspective	9.15	0.0025
Session	7.08	0.0078
Perspective*Session	0.02	0.8796

---

[a] p-values are from one-sided tests of differences between the proportion waived under the approach that makes the misstatement appear less material and the proportion waived under the approach that makes the misstatement appear more material.

effect of materiality perspective does not interact with session, indicating that materiality approach affects partners and managers to the same extent.

Examining individual cases in Table 2 indicates that by far the largest effect of perspective is observed for Case A. This case involves an objective, income-increasing cutoff error that is greater than 5 percent of net income from a cumulative approach (as ending net assets and equity are misstated by that amount), but almost 0 percent of net income from a current-period approach (because adjustment of a similar-sized error was waived in the prior year, and reversal of the prior-year error in the current period offsets the current-year error). Auditors under a cumulative approach waived this error only 23 percent of the time, while auditors under a current-period approach waived this error 70 percent of the time. However, if Case A is dropped from the overall analysis, perspective is still significant ($p = .003$), indicating that the general effect of perspective is not driven by one case.

Previously we noted that the Panel on Audit Effectiveness (2000) suggested that standard setters mandate the use of one materiality approach. Our results demonstrate that it is unclear which approach standard setters should mandate, given that there are some contexts where the current-period approach provides a higher assessment of quantitative materiality, and others where it provides a lower assessment of quantitative materiality, depending on the relation between prior-period and current-period misstatements. Comparing Cases B and C illustrates this context-dependence, holding constant the current-year misstatement (except for a very small difference in amount to prevent participants from thinking they are seeing the same case again), and varying only the prior-year waived adjustment. Results of a repeated-measures logistic regression with approach (current-period versus cumulative) and case (B versus C) as independent variables reveal a significant interaction between approach and case ($p < 0.0001$). Simple effects tests indicate that waiving the adjustment is significantly more likely under the current-period approach for Case B ($p < 0.07$) and significantly less likely under the current-period approach for Case C ($p < 0.0009$).

Quality-of-Earnings Prompt

Although responses indicate that participants did document quality-of-earnings considerations when prompted to do so, "Q of E prompt" was never significant in any analysis. We view this negative result as indicating that unprompted auditors spontaneously consider quality of earnings issues sufficiently to negate any effect of prompt.

Tests of Case Attributes

Adjustment Size and Subjectivity

The cases used to assess robustness of the effects of materiality approach to adjustment size and subjectivity are shown in Table 3. We analyzed the 2 × 2 × 2 contingency table formed by materiality approach (current-period versus cumulative), size of highest quantitative materiality (greater or less than 5 percent), and subjectivity (cutoff error versus reduction of cookie-jar reserve). Logistic regression results reveal a three-way interaction ($p < 0.0007$), indicating that the relation between materiality approach and size differs depending on subjectivity. We break the three-way interaction into two two-way interactions according to subjectivity. Focusing on only recurring cutoff errors (Cases A and B), there is a significant interaction between approach and case ($p < 0.0001$), and simple effects indicate that auditors are more likely to require adjustment under the cumulative approach when the misstatement is large than they are under the current-period approach and/or

TABLE 3
Effects of Approach, Subjectivity, and Size on Percent Waived

Panel A: Descriptive Data

	Case A: Recurring Cutoff Error	Case B: Recurring Cutoff Error	Case D: Reduce Reserve	Case E: Reduce Reserve
Misstatement characteristics				
Subjectivity	Objective	Objective	Subjective	Subjective
Misstatement materiality				
Materiality under current-period approach	0.06% of NI	0.29% of NI	5.76% of NI	3.24% of NI
Materiality under cumulative approach	5.29% of NI	2.35% of NI	0% of NI	0% of NI
Highest quantitative materiality ("size") under either approach	High (5.29%)	Low (2.35%)	High (5.76%)	Low (3.24%)
Percent of adjustments waived				
Current-period approach	70%	75%	48%	74%
Cumulative approach	23%	67%	58%	82%
% waived, low materiality approach − % waived, high materiality approach	47% ($p < 0.0001$)[a]	8% ($p < 0.07$)	10% ($p < 0.07$)	8% ($p < 0.08$)

Panel B: Logit of Materiality Approach, Subjectivity, and Size

3-Way Analysis: Approach by Subjectivity by Size

Source	Chi-Square	Pr > Chi-Square
Approach	5.15	0.0233
Subjectivity	4.00	0.0454
Approach*Subjectivity	22.48	< .0001
Size	79.00	< .0001
Approach*Size	15.33	< .0001
Subjectivity*Size	0.13	0.7183
Approach*Subjectivity*Size	11.43	0.0007

2-Way Analysis: Effects of Approach and Level for Objective Misstatements

Source	Chi-Square	Pr > Chi-Square
Approach	23.26	< .0001
Size (A versus B)	46.08	< .0001
Approach*Size	28.94	< .0001

2-Way Analysis: Effects of Approach and Level for Subjective Misstatements

Source	Chi-Square	Pr > Chi-Square
Approach	2.88	0.0894
Size (D versus E)	42.67	< .0001
Approach*Size	0.02	0.8789

---

[a] p-values are from one-sided tests of differences between the proportion waived under the approach that makes the misstatement appear less material and the approach that makes the misstatement appear more material.

when the misstatement is small.[10] Focusing on only reductions of reserves (Cases D and E), there is no interaction between approach and case ($p = 0.8789$), and main effects indicate that auditors are more likely to require adjustment under the current-period approach (which makes materiality appear higher, $p < 0.05$) and when the misstatement is large ($p < 0.0001$).[11]

This analysis leads to a few conclusions. First, materiality approach has some effect in all cells, indicating that its effect is robust. Second, with large misstatements, approach matters more in the objective cutoff setting (Case A) than in the subjective reserve-reduction setting (Case D).

Current-Period Income Effect

Table 4 shows the cases used to assess robustness of the effects of materiality approach to directional income effect of the adjustment. For both cases, we held constant the amount of misstatement, and vary whether the misstatement decreases (Case F) or increases (Case

TABLE 4
Effects of Approach and Income Effect on Percent Waived

Panel A: Descriptive Data

	Case F: Overstating Reserve	**Case G: Understating Reserve**
Misstatement characteristic		
Effect of misstatement on current net income	Decrease	Increase
Percent of adjustments waived		
Current-period approach	59%	48%
Cumulative approach	47%	39%
% waived, low materiality approach − % waived, high materiality approach	12% ($p = 0.04$)[a]	9% ($p = 0.08$)

Panel B: Logit of Materiality Approach and Current Income Effect of Misstatement

Source	**Chi-Square**	**Pr > Chi-Square**
Approach	3.21	0.0733
Income effect (F versus G)	8.85	0.0029
Approach*Income effect	0.03	0.8569

[a] p-values are from one-sided tests of differences between the proportion waived under the approach that makes the misstatement appear less material and the proportion waived under the approach that makes the misstatement appear more material.

---

[10] In addition to showing that materiality approach is particularly important for the large, objective, income-increasing cutoff error Case A, this significant interaction also highlights that error size has a large effect on judgments under the cumulative approach, with the proportion of waived adjustments in the large error Case A (23 percent) significantly lower than the proportion in the small error Case B (67 percent, $p < 0.0001$).

[11] In this 2×2 analysis, approach covaries with subjectivity, with the cumulative approach always indicating higher materiality for the objective cases and the current-period approach always indicating higher materiality for the subjective cases. This design choice enables cases to reflect common practice settings, but it allows an alternative interpretation of the interaction: rather than indicating auditors are more sensitive to approach when misstatements are large and objective, the interaction could be interpreted as indicating auditors are more sensitive to approach when misstatements appear larger under the cumulative approach. We are not aware of any theory or intuition that is consistent with this interpretation, but we cannot rule it out with our data.

G) current-period net income. We analyzed the 2 × 2 contingency table formed by materiality approach (current-period versus cumulative) and income effect (increase versus decrease). Consistent with prior research, income effect is significant, indicating that auditors are less likely to waive adjustments of income-increasing misstatements than they are adjustments of income-decreasing misstatements ($p = 0.003$). Materiality approach is marginally significant ($p = 0.0733$). There is no interaction between approach and income effect, indicating that the effects of approach are robust to differences in directional income effect.

Misstatement Precision

Table 5 shows the cases used to assess robustness of the effects of materiality approach to misstatement precision. For both cases, we held constant the amount of misstatement, but varied misstatement precision by defining the misstatement as either a point estimate (Case G) or the low end of a range (Case H).[12] We analyzed the 2 × 2 contingency table formed by materiality approach (current-period versus cumulative) and precision (point estimate versus end point of range). Results indicate a significant main effect of precision ($p = 0.0012$), but no significant interaction with or main effect of approach, although simple effects tests suggest that approach influences adjustment decisions when adjustments are defined by point estimates ($p = 0.07$), but not otherwise. These results are consistent with auditors being less likely to waive adjustment in the range setting, regardless of materiality

TABLE 5
Effects of Approach and Precision on Percent Waived

Panel A: Descriptive Data

	Case G: Understating Reserve (Point)	Case H: Understating Reserve (Range)
Misstatement characteristic		
Precision of estimate	Point prediction	Lower end of range
Percent of adjustments waived		
Current-period approach	48%	34%
Cumulative approach	39%	33%
% waived, low materiality approach − % waived, high materiality approach	9% ($p = 0.08$)[a]	1% (NS)

Panel B: Logit of Materiality Approach and Precision of Misstatement

Source	Chi-Square	Pr > Chi-Square
Approach	0.83	0.3615
Precision (G versus H)	10.48	0.0012
Approach*Precision	1.32	0.2510

[a] p-values are from one-sided tests of differences between the proportion waived under the approach that makes the misstatement appear less material and the proportion waived under the approach that makes the misstatement appear more material.

---

[12] The slight difference in misstatement of \$7.25 for the point estimate and \$7.1 for the range's lower bound is designed to bias against finding that auditors are more likely to require adjustment of a misstatement that was the low end of a range. The range's upper bound was \$15.1.

approach, perhaps because of a concern that actual misstatements might exceed the lower-bound adjustment required by GAAP. Regarding effects of materiality approach, perhaps the only conclusion possible from this analysis is that approach has little effect when adjustments are defined as the endpoint of a range.

When session is added to this analysis, we find that it has a significant main effect (p = 0.0307) and interaction with precision (p = 0.0574). Simple effects tests reveal that managers rather than partners drive the main effect of precision in the preceding analysis. Specifically, when a misstatement is the lower end of a range, managers are significantly less likely to waive adjustment than are partners (29 percent waived by managers versus 49 percent waived by partners; p = 0.0057). When a misstatement is specified by a point estimate, managers are insignificantly less likely to waive adjustment than are partners (42 percent waived by managers versus 51 percent waived by partners; p = 0.2155). Thus, in general managers appear less likely to waive adjustment of these cases than partners, particularly when there is uncertainty about misstatement size.

Additional Analyses

Self-Insight

Responses to debriefing questions indicate 69 percent (31 percent) of participants believe their adjustment decisions are (are not) influenced by whether the current-period or cumulative approaches are used for a client. However, when added to the overall analysis, "belief" does not interact significantly with materiality perspective (p = 0.5654), indicating that the effect of materiality perspective does not depend on whether auditors think it has an effect. Also, when separate analyses are run for each level of belief, materiality perspective is significant for both the "believe it influences judgments" group (p = 0.0001) and the "believe it does not influence judgments" group (p = 0.0086), suggesting that many auditors lack self-insight concerning the effect of materiality approach on their adjustment decisions.

Experience with Materiality Approach

Responses to debriefing questions indicate 8 percent (35 percent) of auditors assigned to the cumulative (current-period) treatments lacked prior experience with that treatment. When added to the overall analysis, "prior experience with assigned method" does not interact significantly with materiality perspective (p = 0.3881), indicating that the effect of materiality perspective does not depend on whether auditors have experience with the method they were assigned.

Judged Appropriateness of Materiality Approach

Responses to debriefing questions indicate 60 percent (40 percent) of participants believe the cumulative (current-period) approach is more appropriate in general. When added to the overall analysis, "method appropriateness" does not interact significantly with materiality perspective (p = 0.5024), indicating that the effect of materiality perspective does not depend on judged method appropriateness.

Judged Appropriateness of Rollover of Specific Misstatements

Responses to debriefing questions indicate a lack of consensus among auditors concerning whether particular misstatements are appropriate for "rollover" (i.e., offset) between periods when the current-period approach is used. Seventy-seven percent indicated that rollover of cutoff errors was appropriate, and 52 percent indicated that rollover of bad debts reserves was appropriate. In general, auditors who consider the current-period method to be more appropriate were more likely to indicate that rollover of particular misstatements was appropriate ($p = 0.0001$). Also, analyses of individual cases often reveal a significant effect of appropriateness judgment, indicating that auditors considered whether rollover of a particular misstatement was appropriate when making adjustment decisions. However, appropriateness never interacted with materiality approach or perspective in any analysis of auditors' adjustment decisions, indicating that the effects of materiality approach do not depend on judged appropriateness of rollover.

V. DISCUSSION

The results of our experiment indicate a robust effect of materiality approach on auditors' adjustment decisions. Holding constant all information relevant to the company, prior waived adjustments and current proposed adjustments, auditors were more likely to require adjustment under the materiality approach that made the misstatement appear more material quantitatively. This result held regardless of misstatement size, subjectivity, income effect, auditors' belief about whether approach influenced their judgments, or the presence of a prompt to consider the effect of the client's preferred accounting treatment on current and future quality of earnings.

The largest effect of materiality approach was observed for a case in which a large, repeating cutoff error increased current income. When evaluated under the cumulative approach, this case indicated an objective, income-increasing effect of greater than 5 percent of net income, and only 23 percent of auditors waived adjustment; when evaluated under the current-period approach, the effect of the error was close to zero, and 70 percent of auditors waived adjustment. This case highlights that differences in materiality approach can produce large differences between audit treatments of amounts that all auditors would agree are large and misstated.

These results cannot be attributed to auditors comparing quantitative materiality to a "bright-line threshold." Although the firm providing participants requires auditors to get additional approval before waiving misstatements that exceed 5 percent of net income, approach is significant for four of the five cases in which quantitative materiality never exceeds 5 percent. Even when approach varies whether a misstatement exceeds 5 percent, the effect of approach interacts with misstatement subjectivity, indicating a more complex decision process than would be indicated by the 5 percent threshold.

The three-way interaction between subjectivity, size, and approach suggests that subjectivity offsets some of the effect of approach. In the objective setting, the cumulative approach highlights a clear balance sheet distortion and encourages auditors to require adjustment, and the current-period approach highlights a clearly negligible income effect, which encourages auditors to waive adjustment. In the subjective setting, the cumulative approach highlights a balance sheet correction that may be opportunistic, while the current-period approach highlights an income increase that could be the result of an honest revision of estimate, so auditors may be able to rationalize making both adjustment decisions. Thus, subjectivity appears to reduce the extremity of adjustment probabilities, and although misstatement subjectivity is listed explicitly in SAB No. 99 as a qualitative characteristic that increases materiality and thus presumably increases the likelihood that an auditor will require adjustment, our results indicate that auditors respond to subjectivity by being less likely to adjust large misstatements.

The only case producing an insignificant effect of materiality approach involved a reserve misstatement that was defined (as required by FIN No. 14) as the low point of a range of possible values. Regardless of materiality approach, auditors were more likely to require adjustment of such "range-defined" misstatements compared to misstatements that were defined by a point estimate, consistent with SAB No. 99 and suggesting awareness that the actual amount of a "range-defined" misstatement might exceed the adjustment proposed. This case was also the only one for which we observed differences between partners and managers, with partners more likely to waive adjustment than managers. This result suggests that audit partners may counteract the conservatism that managers attempt to introduce with respect to imprecisely defined misstatements.

Our experiment is subject to the limitations common to experimental research. We believe the most important limitation is that, because cases necessarily abstract from actual audit practice, it is not possible to generalize to audit practice the *levels* of waived adjustments observed in the experimental setting. For example, it is possible that auditors would have required adjustment more often if our case had included more of the qualitative materiality dimensions mentioned in SAB No. 99. However, it is possible to infer that auditors are willing to waive at least some adjustments, and to generalize the directional effects that we identify to directional effects that would occur in practice. Similarly, we cannot prove economic significance of the results that we identify. However, we note that a single waived audit adjustment can be economically significant, should an audit be viewed as having failed as a result, so factors that reliably affect auditors' propensity to waive adjustments are likely to be important.

One response to these results could be for standard setters to consider mandating either the cumulative or current-period approach, or at least for them to require that materiality approach be disclosed clearly among the accounting policies described in financial statements. However, as demonstrated in this study, the effects of approach are bi-directional, with the cumulative approach producing higher quantitative materiality in some settings and the current-period approach producing higher quantitative materiality in other settings. Thus, it is unclear which approach standard setters should mandate, or how financial statement users would interpret a simple disclosure of approach. We believe a better alternative would be to require adjustment of amounts that are material under either approach. Future research could address this issue by examining auditors' adjustment decisions and varying whether auditors are provided with one or both materiality approaches.

Another interesting avenue for future research is to examine auditors' decisions about which approach to adopt for a new client. It is possible that various factors that we hold constant in our experiment (e.g., client industry, client financial condition) influence approach adoption. Our study examines auditors' adjustment decisions with respect to an ongoing client, and so could not examine the factors that auditors might consider when making their initial choice of materiality approach.

APPENDIX

Example of the Current-Period and Cumulative Materiality Approaches

"Cookie Jar" Reserves

Whether the current-period or cumulative approach yields a higher quantitative materiality depends on the specific context in which the approach is applied. For example, consider the case of "cookie jar" reserves, whereby firms overstate expenses to build an excess reserve that can be adjusted downward in a future period to increase income (Levitt 1998). Assume a company increases a bad-debts reserve by recognizing excess expense of \$10 million in three consecutive periods, with the intention of reducing the reserve (and increasing income) by \$30 million in the fourth period. The cumulative approach focuses on the amount of misstatement in the end-of-period reserve balance, so calculates quantitative materiality based on a misstatement of (\$10) in period 1, (\$20) in period 2, (\$30) in period 3, and $0 in period 4 (since reduction of the reserve by $30 during period 4 eliminates any overstatement in the period 4 reserve balance). The current-period approach focuses on the new misstatement added in the current period, so calculates quantitative materiality based on a misstatement of ($10) in periods 1–3 and $30 in period 4 (since reduction of the reserve increases period 4 income by $30). For this example the cumulative approach provides higher quantitative materiality during the reserve build up, and so may reduce the likelihood that an auditor allows a large reserve to accumulate. The current-period approach assesses higher quantitative materiality during the period in which the reserve is reduced, and so may better highlight the need for a prior-period adjustment in that period.

Cutoff Errors

Materiality differences between current-period and cumulative approaches are not confined to reserves. Rather, holding constant a current-year misstatement, the current-period and cumulative approaches can yield different quantitative materiality whenever prior-year audit adjustments have been waived. As another example, assume a firm has a recurring "late cutoff" error, such that prior-year sales included $10 million of current-year sales, and current-year sales include $12 million of next-year sales. The cumulative approach focuses on the end-of-period error in accounts receivable and equity, and quantifies the misstatement as a $12 million overstatement. The current-period approach *offsets* the $10 million understatement or current-year sales that resulted from the prior-year late cutoff with the $12 million overstatement that resulted from the current-year late cutoff, and quantifies the misstatement as a net $2 million overstatement. Thus, the cumulative approach yields a higher quantitative materiality.

Now modify the cutoff example by instead assuming an *early* cutoff in the prior year, such that $10 million of prior-year sales are included in current-year sales, as well as retaining the assumption of a late cutoff in the current year, such that $12 million of next-year sales are included in the current year. In this case, the cumulative approach provides the same $12-million-based materiality as it did in the other example. However, the current-period approach views the prior-year and current-year misstatements as having *compounding* effects on current-year net income of $10 + $12 = $22 million, thus yielding a higher quantitative materiality. This example illustrates how differences between approaches are driven by prior-period waived misstatements, and that the relation between the prior-period and current-period misstatement determines which approach yields the higher materiality.

REFERENCES

American Institute of Certified Public Accountants (AICPA). 1984. *Audit Risk Materiality in Conducting an Audit.* Statement on Auditing Standards No. 47. New York, NY: AICPA.

———. 1999. *Audit Adjustments.* Statement on Auditing Standards No. 89. New York, NY: AICPA.

———. 2000a. *Audit Committee Communications.* Statement on Auditing Standards No. 90. New York, NY: AICPA.

———. 2000b. *Interpretations of AU Section 312, Audit Risk and Materiality in Conducting an Audit.* New York, NY: AICPA.

Arens, A. A., and J. K. Loebbecke. 1997. *Auditing: An Integrated Approach.* Seventh edition. Upper Saddle River, NJ: Prentice Hall.

Ashton, R. H. 1990. Pressure and performance in accounting decision settings—Paradoxical effects of incentives, feedback, and justification. *Journal of Accounting Research* 28 (Supplement): 148–180.

Boatsman, J. R., C. Moeckel, and B. K. W. Pei. 1997. The effects of decision consequences on auditors' reliance on decision aids in audit planning. *Organizational Behavior and Human Decision Processes* 71 (2): 211–247.

Bonner, S. E., R. Libby, and M. W. Nelson. 1996. Using decision aids to improve auditor's conditional probability judgments. *The Accounting Review* 71 (April): 221–240.

Braun, K. W. 2001. The disposition of audit-detected misstatements: An examination of risk and reward factors and aggregation effects. *Contemporary Accounting Research* 18 (1): 71–100.

Carcello, J. V., and Z-V. Palmrose. 1994. Auditor litigation and modified reporting on bankrupt clients. *Journal of Accounting Research* 32 (Supplement): 1–30.

Eining, M. M., D. R. Jones, and J. K. Loebbecke. 1997. Reliance on decision aids: An examination of auditors' assessment of management fraud. *Auditing: A Journal of Practice & Theory* 16 (2): 1–19.

Financial Accounting Standards Board (FASB). 1976. *Reasonable Estimation of the Amount of a Loss.* Interpretation No. 14. Stamford, CT: FASB.

———. 1980. *Qualitative Characteristics of Accounting Information.* Statement of Financial Accounting Concepts No. 2. Stamford, CT: FASB.

Holstrum, G. L., and W. F. Messier, Jr. 1982. A review and integration of empirical research on materiality. *Auditing: A Journal of Practice & Theory* (Fall): 45–63.

Houghton, C. W., and J. A. Fogarty. 1991. Inherent risk. *Auditing: A Journal of Practice & Theory* 10 (1): 1–21.

Iceman, R. C., and W. A. Hillison. 1991. Disposition of audit-detected errors—Some evidence on evaluative materiality. *Auditing: A Journal of Practice & Theory* 10 (1): 22–34.

Kachelmeier, S. J., and W. F. Messier. 1990. An investigation of the influence of a nonstatistical decision aid on auditor sample-size decisions. *The Accounting Review* 65 (1): 209–226.

Kennedy, J., T. Mitchell, and S. E. Sefcik. 1998. Disclosure of contingent environmental liabilities: Some unintended consequences? *Journal of Accounting Research* 36 (Autumn): 257–277.

Kinney, W. R., and R. D. Martin. 1994. Does auditing reduce bias in financial reporting? A review of audit-related adjustment studies. *Auditing: A Journal of Practice & Theory* 13 (1): 149–156.

Levitt, A. 1998. The numbers game. Remarks delivered at the NYU Center for Law and Business, New York, NY, September 28.

Libby, R., and W. R. Kinney. 2000. Earnings management, audit differences, and analysts' forecasts. *The Accounting Review* 75 (4): 383–404.

Messier, W. F., S. J. Kachelmeier, and K. L. Jensen. 2001. An experimental assessment of recent professional developments in nonstatistical audit sampling guidance. *Auditing: A Journal of Practice & Theory* 20 (1): 81–96.

Moriarity, S., and F. H. Barron. 1976. Modeling the materiality judgments of audit partners. *Journal of Accounting Research* 14 (2): 320–341.

Morris, M. H., and W. D. Nichols. 1988. Consistency exceptions: Materiality judgments and audit firm structure. *The Accounting Review* 62 (2): 237–254.

Nelson, M. W., J. A. Elliott, and R. L. Tarpley. 2002. Evidence from auditors about managers' and auditors' earnings management decisions. *The Accounting Review* 77 (Supplement): 175–202.

———. 2003. Behavioral evidence on the effects of principles- and rules-based standards. *Accounting Horizons* 17 (1): 91–104.

———. 2004. A review of experimental and archival conflicts-of-interest research in auditing. In *Conflicts of Interest: Problems and Solutions in Law, Medicine, and Organizational Settings*, edited by D. A. Moore, D. M. Cain, G. Loewenstein, and M. H. Bazerman. Cambridge, U.K.: Cambridge University Press.

Newton, L. K. 1977. The risk factor in materiality decisions. *The Accounting Review* 52 (1): 97–108.

Ng, T. B., and H. T. Tan. 2002. Effects of authoritative guidance availability and audit committee effectiveness on auditors' judgments in auditor-client negotiations of audit adjustments. Working paper, Nanyang Technological University.

Panel on Audit Effectiveness. 2000. *Report and Recommendations.* August 31. Stamford, CT: Public Oversight Board.

Pattillo, J. W. 1976. Materiality in financial reporting. *The CPA Journal* 46 (November): 76.

Securities and Exchange Commission (SEC). 1999. *Materiality*. SEC Staff Accounting Bulletin No. 99. August 12. Washington, D.C.: SEC.

St. Pierre, K., and J. A. Anderson. 1984. An analysis of the factors associated with lawsuits against public accountants. *Accounting Review* 59 (2): 242–263.

Taub, S. 2004. Remarks by the SEC Deputy Chief Accountant at the University of Southern California, Leventhal School of Accounting, SEC and Financial Reporting Institute Conference, May 27. Available at: http://www.sec.gov/news/speech/spch052704sat.htm.

Turner, L. 2000. Opportunities for improving quality. Speech by the SEC Chief Accountant before the Colorado Society of CPAs, December 15.

Wright, S., and A. M. Wright. 1997. The effect of industry experience on hypothesis generation and audit planning decisions. *Behavioral Research in Accounting* 9: 273–294.

THE ACCOUNTING REVIEW
Vol. 80, No. 3
2005
pp. 921–939

The Halo Effect in Business Risk Audits: Can Strategic Risk Assessment Bias Auditor Judgment about Accounting Details?

Ed O'Donnell
Arizona State University

Joseph J. Schultz, Jr.
Arizona State University

ABSTRACT: Many auditors use an audit methodology that requires a strategic risk assessment of their client's business model as a first step for assessing audit risks. This study examines whether the holistic perspective that auditors acquire in making a strategic risk assessment influences the extent to which they adjust account-level risk assessments when they encounter changes in accounts that are inconsistent with information about client operations. Based on halo theory from the performance evaluation literature, we hypothesize that auditors who (1) perform (do not perform) strategic assessment, and (2) develop favorable (unfavorable) strategic risk assessments, are less (more) likely to adjust account-level risk assessments for inconsistent fluctuations. Data from two laboratory experiments using experienced auditors support both hypotheses. Findings suggest that the halo effect generated during strategic assessment influences judgment by altering auditor tolerance for inconsistent fluctuations.

I. INTRODUCTION

In an attempt to improve their understanding of client business risk, many assurance services firms have developed a new approach to auditing financial statements that increases auditor attention to risks associated with their client's business strategy (Lemon et al. 2000). Auditors who use this business risk audit approach conduct strategic assessment to develop a holistic perspective of their client's business model (Bell et al. 2002). During strategic assessment, auditors focus on the organization's overall prospects—they learn about their client's strategy for creating customer value and then identify and document strategic business risks that threaten the business model (Eilifsen et al. 2001).

We appreciate the suggestions provided by Efrim Boritz, Christine Earley, Steve Glover, Steve Kaplan, Robert Knechel, Lisa Koonce, Natalia Kotchetova, Kurt Pany, Mark Peecher, Steve Salterio, Jeff Wilks, Arnold Wright, Bill Wright, and participants in research workshops at Arizona State University, Boston College, University of Connecticut, Louisiana State University, University of Waterloo, and the Midyear Meeting of the AAA Auditing Section. This research was supported by a grant from the Small Grant Program at Arizona State University, W. P. Carey School of Business.

Editor's note: This paper was accepted by Jane Kennedy, Editor.

Submitted March 2004
Accepted January 2005

Assessing strategic risk provides auditors with a rich context for evaluating audit evidence (Bell et al. 1997). Proponents assert that this holistic appraisal should help auditors recognize business conditions that impact audit risk across a variety of dimensions (Bell et al. 2002). Standard setters have endorsed strategic assessment as an important auditing procedure (AICPA 2002). Interviews conducted during this study reveal that each of the Big 4 audit firms requires their auditors to assess strategic risks early in an audit engagement. However, while strategic assessment is becoming institutionalized in audit practice, research examining its effect on audit judgment is just beginning to emerge (Ballou and Heitger 2004).

To the extent that a strategic assessment is valid and diagnostic of the client's future prospects, it seems logical that it should assist auditors in framing other assessments needed to complete the audit effectively. Our research question is more limited. We ask if strategic assessment influences auditors' ability to recognize risks that manifest at a more granular level. Specifically, could focusing on clients' overall prospects reduce the salience of audit evidence contained in accounting details? For example, a lack of auditor sensitivity to accounting details apparently played a role in the audit failure at WorldCom. External auditors, who believed that WorldCom had a successful business model and a viable business strategy (Kaplan and Kiron 2004), failed to interpret a $3.8 billion increase in capital expenditures and decrease in routine maintenance costs as a pattern of changes in accounts that signaled material financial misstatement (Glater and Eichenwald 2002).

In this study, we examine whether developing a holistic opinion about the strategic viability of a business model influences the misstatement risk that auditors attribute to patterns of fluctuations in accounts. Studies on performance evaluation show that evaluative judgments based on holistic characteristics have a "halo effect" on evaluative judgments about performance details (Murphy et al. 1993). Developing performance evaluations based on holistic characteristics reduces the influence of diagnostic information about detailed attributes. Typically, a favorable holistic evaluation leads to an overly positive assessment of information related to detailed performance measures. If auditors' strategic risk assessments produce a similar effect, then favorable judgments about the strategic viability of a client's business model may lead the auditor to unduly discount account-level changes that are inconsistent with client operations.

We examine this research question using data from two laboratory experiments. Experienced auditors develop (do not develop) favorable or unfavorable holistic opinions about strategic business risks, then perform analytical procedures to assess misstatement risk for selected financial statement accounts. There are three significant findings. First, account-level risk assessments developed by auditors who perform strategic assessment are less sensitive to inconsistent fluctuations than account-level risk assessments developed by auditors who do not assess strategic risks. Second, auditors who develop or are endowed with lower strategic risk assessments (favorable halo) are less sensitive to inconsistent fluctuations in accounts than auditors who develop or receive higher strategic risk assessments (unfavorable halo). Third, because our analyses revealed no evidence that strategic assessment influenced expectations about fluctuation in account balances or levels of effort and attention devoted to analyzing changes in accounts, it appears that the halo associated with strategic risk assessments influences auditor judgment by altering their tolerance for differences between actual and expected changes in the account.

These results should not be construed as an indictment of the potential for strategic assessment to improve audit effectiveness. Analyzing strategic risks could enhance auditor judgment across a range of auditing decisions that are beyond the scope of this study. The issue for audit practice is not whether to perform strategic assessment, but rather how to structure this important audit task to avoid undesirable consequences. Assurance services firms may want to review their procedures for strategic assessment to ensure that they are reaping the benefits without diminishing the likelihood of properly evaluating evidence from accounting details.

This paper extends auditing research in the following ways. First, it introduces halo theory to the auditing literature and applies it to an important practice area (strategic assessment). Second, it extends knowledge of how holistic judgment (strategic risk assessment) influences audit-planning-phase analytical procedures by demonstrating the influence of an overall evaluative judgment on the evaluation of detailed evidence about account-level risk. Growing acceptance of strategic assessment makes this knowledge important. Due to increasing emphasis on more subjective judgments (e.g., business risk assessment and analytical procedures) and decreasing emphasis on more objective substantive tests of details (Kinney and Felix 1993; Glover et al. 2003), the need to understand any bias in planning-phase judgments is paramount because biases at these levels can cascade throughout the remainder of the audit, resulting in distorted evaluations of achieved audit risk. Third, the study augments research that deals with the deleterious effects that holistic audit judgments can have on the diagnosticity attributed to more detailed evidence that auditors acquire later in the audit (e.g., Phillips 1999; Wilks 2002).

The remainder of this study is organized into three sections. Section II describes the theoretical framework that provides a foundation for our study and presents the research hypotheses. Section III describes our experimental method and discusses results. Section IV provides our conclusions, acknowledges the limitations of our study, and suggests future research.

II. THEORY AND HYPOTHESES

Auditors who use the business risk auditing approach gather preliminary evidence about misstatement risk primarily from two auditing procedures, strategic assessment and analytical procedures, then design a program of substantive tests based on this knowledge (Bell et al. 1997). These two procedures allow auditors to tailor their substantive tests of details to reduce the likelihood of failing to detect materially misstated accounts. A key step in determining these tests is to identify financial statement accounts that have a greater risk of material misstatement. Our study examines how strategic assessment can influence the account-level risk assessments that auditors develop during analytical procedures. In this section, we describe these two auditing procedures, explain how strategic assessment could produce a halo that influences auditor judgment during analytical procedures, and present our research hypotheses.

Auditing Context

Strategic assessment provides auditors with an overall (holistic) perspective on their clients' business model (Bell et al. 1997). During this diagnostic task, auditors learn about their clients' business processes (e.g., bringing products and services to market) and assess risks that threaten the organization's ability to execute the processes effectively. For example, the audit methodology used by the firm that provided participants for this study directs its auditors to perform strategic assessment in three sequential phases.

First, auditors document client operations (or update this documentation for continuing clients). Documentation includes, among other things, descriptions of (1) strategic objectives, (2) core processes used to achieve those objectives, (3) internal and external drivers that constrain those processes, and (4) strategic management processes the client uses to monitor and control their business model. Second, auditors analyze strategic risks and identify significant classes of transactions that could be threatened by those risks. Third, they perform a process analysis by (1) linking strategic risks and significant classes of transactions documented during the second phase to specific processes documented during the first phase; (2) evaluating factors that are critical to the success of each process; (3) identifying key performance indicators; and (4) using those metrics to analyze process performance. In other words, they assess how well the client is achieving its strategic business objectives.

This strategic assessment focuses on business processes and market conditions—the overall perspective. The objective is to understand conditions that influence strategic risks by evaluating the likelihood that processes will not work as intended. Auditors turn their attention to accounting details when they undertake analytical procedures. The objective of analytical procedures is to assess account-level audit risks so that auditors can target substantive auditing procedures to address those risks.

Auditors begin analytical procedures by learning about client operating activities and procedures used to account for business transactions. During analytical procedures, auditors analyze interperiod fluctuations in account balances and search for patterns of changes that are inconsistent with their understanding of client procedures and operations (Koonce 1993). When auditors believe that fluctuations are consistent with their understanding of client operations, they usually follow a standard program for testing individual account balances and may even decrease audit effort by reducing testing from prior year levels. In contrast, when auditors believe that fluctuations are inconsistent, they should increase misstatement risk for the account and expand audit effort by implementing additional tests. As a result, factors that affect auditor judgment about inconsistent fluctuations in accounts can have a significant impact on the likelihood that they will detect financial misstatements.

Throughout this paper, we use the term "inconsistent fluctuations" to describe changes in account balances that are not consistent with other information about client business operations. For example, a significant increase in accounts receivable from last year to this year would be inconsistent with information that sales and accounts receivable turnover are not significantly different from last year.

The central question in our study is whether the holistic evaluations that auditors develop when they assess strategic business risks affect their judgment about evidence from account-level details acquired during analytical procedures, even when strategic risks have no bearing on that particular audit evidence. Strategic risk assessments may have direct implications for some accounts but very limited implications for other accounts. For example, a new strategy leading to improved product quality is likely to influence fluctuations in warranty expense far more directly than fluctuations in accounts receivable.

Research has shown that holistic evaluative judgments can influence how auditors search for and evaluate detailed evidence. For example, Phillips (1999) found that auditors who analyzed evidence for accounts that had previously been classified as low risk were less sensitive to evidence of aggressive financial reporting in those accounts than auditors who analyzed the same information for accounts classified as high risk. Wilks (2002) found that auditors provided with the engagement partner's going-concern evaluation before evaluating detailed evidence and developing a going-concern judgment tended to conform to the partner's evaluation. These studies demonstrate that, when firm practices encourage auditors to develop a holistic opinion about a judgment task before they analyze detailed audit evidence, their holistic opinion biases evaluation of more granular diagnostic information.

Our study examines an audit decision context that differs from previous research in four ways. First, while Phillips (1999) examined a practice related to firm-specific procedures, we examine a practice advocated by auditing standard setters (AICPA 2002). Second, Phillips (1999) and other auditing researchers (e.g., Bamber and Bylinski 1987; Cohen and Kida 1989) have studied how different perceptions about account-level risk influence the search for and attention to account-level evidence. Our study focuses on how different perceptions about holistic business risks influence how account-level evidence is weighted. Third, Wilks (2002) examined the influence of holistic opinions about going concern that are developed near the end of an audit engagement (AICPA 2001, AU § 341). We examine the influence of holistic opinions that come very early in the audit process and are likely to influence many subsequent judgments. Fourth, prior studies (e.g., Phillips 1999; Wilks 2002) focus on how preliminary holistic opinions about an audit judgment task can influence the evaluation of subsequent, more detailed evidence closely related to the same task. Our study examines how holistic opinions (strategic risk assessments) can bias judgments about detailed audit evidence (patterns of changes in accounts) when the holistic opinions have virtually no direct implication for the more detailed evidence. To this end, we adapt a relevant theory from performance evaluation research.

Halo Theory

The original proponent of the halo effect defined it as a "marked tendency to think of the person in general as rather good or rather inferior and to color the judgments of the [person's specific performance attributes] by this general feeling" (Thorndike 1920, 25). Evaluative judgments that produce a halo subconsciously increase the diagnostic value afforded to information about holistic performance perceptions about the ratee, and diminish diagnosticity of analytic information about specific attributes of the ratee's performance (Balzer and Slusky 1992). When raters develop a holistic opinion of the person to be evaluated prior to analyzing detailed diagnostic information about the person, they tend to evaluate detailed performance information to be consistent with their holistic opinion (Murphy et al. 1993). The tendency to confirm initial evaluative judgments is often attributed to the need to reduce cognitive dissonance between the holistic judgment and the judgment of information underlying specific details (Devine et al. 1990).

Studies have provided evidence supporting the halo phenomenon in a variety of performance evaluation contexts (Nisbett and Wilson 1977). Halo effects are particularly prevalent when information is evaluated using a top-down task structure, that is, when the rater acquires general information before evaluating detailed performance criteria (Murphy et al. 1993). For example, Finucane et al. (2000) found that the overall impression people formed about the holistic attributes of decision alternatives created a halo that biased their evaluative judgments related to detailed analytic information about the level of risk associated with each alternative. That is, when sets of overall decision outcomes were viewed as more attractive, the resulting decision tended to be favorable in spite of the fact that detailed information suggested otherwise. Work by Slovic et al. (2002) and Lance et al. (1994) concludes that the favorable or unfavorable valence of an overall performance judgment is positively related to a bias that influences the evaluation of detailed performance criteria.

Conditions in the audit environment seem likely to encourage a halo effect from strategic assessment. Studies show that the halo effect on judgments regarding specific performance characteristics is intensified when the overall judgment is complex (Murphy et al. 1993) and highly salient (Balzer and Slusky 1992). When auditors perform strategic assessment, the complexity and ambiguity of the task require a nontrivial commitment of cognitive effort (Bell 2004). Requiring auditors to document their conclusions during strategic assessment is likely to make their holistic judgment about strategic risk quite salient. Moreover, since strategic assessment is intended to frame all subsequent audit judgments (Bell et al. 1997), salience of the resulting judgment seems apparent.

In summary, if strategic assessment produces a halo effect, then the holistic judgment that auditors develop when they assess strategic risk will influence their judgment about the level of misstatement risk associated with changes in account balances. Halo theory suggests that developing a holistic judgment about strategic risk will reduce the diagnosticity of detailed evidence about changes in account balances, even if strategic risk has no direct implications for that account-level evidence. As a result, performing strategic assessment should reduce the extent to which evidence provided by inconsistent fluctuations influences account-level misstatement risk. Furthermore, auditors who evaluate strategic risk at higher (lower) levels are also likely to evaluate account-level misstatement risk at higher (lower) levels.

These associations between strategic assessment and analytical procedures give rise to the following alternative-form research hypotheses:

H1: For auditors who perform strategic assessment before analytical procedures, the difference between account-level risk assessments in the presence versus absence of inconsistent fluctuations will be less than the difference between account-level risk assessments for auditors do not perform strategic assessment before analytical procedures.

H2: When auditors perform strategic assessment before analytical procedures, assessments of strategic risk will be positively correlated with assessments of misstatement risk that auditors develop for accounts with inconsistent fluctuations.

III. METHOD

We test these research hypotheses using two laboratory experiments. The first experiment provides evidence for testing H1 and H2. The second experiment provides evidence for replicating tests of H2 under different conditions, and for evaluating alternative explanations for our findings. The experiments were conducted during two separate national training sessions for senior-level auditors who worked for one Big 4 firm.

All participants were classified as seniors. Some had recently been promoted to senior and had little or no experience supervising field work, while others had been in-charge auditors for as long as four years. Groups of about 30 participants completed the experimental exercise in their classrooms during a one-hour period that had been set aside for conducting research. Each classroom was supervised by a research proctor who distributed and collected the experimental instruments and monitored participants while they completed the task.

Both experiments were conducted in three phases. Participants received a package containing three envelopes labeled phases one, two, and three, and completed the phases in sequence. After completing each phase, participants sealed the materials in the envelope for that phase so that they could not refer to that information during subsequent phases. Research proctors monitored participants' compliance with these instructions.

The same strategic auditing case was used for both experiments with slight changes in the accounting metrics and client operating information. Case materials were patterned after the Loblaw Companies, Ltd. case for a chain of grocery stores (Greenwood and Salterio

2002) and account balances were adapted from the annual report for Safeway, Inc. The controller for a regional grocery chain (similar to the one described in the case) provided metrics for key performance indicators and reviewed the materials for realism.

Information about client operations was grouped by strategic business processes in the same format as the audit support software that participants used in the field. The comparative account balance information that participants used for analytical procedures was presented in four columns, which included balances for this year and last year, and the amount and percent of change between years. Information for key performance indicators included the same four columns of information plus the industry best-practices standard. In an attempt to make auditors more sensitive to unusual improvements in performance and increase their concern about unexpected fluctuations in accounts related to financial performance, all cases indicated that the company was currently negotiating a merger with a larger competitor.

In experiment one, some of the cases included an inconsistent-fluctuation manipulation while others did not. All cases stated that unit sales prices, sales mix, and product costs had not significantly changed from last year to this year, which suggests that fluctuations in cost of sales should be proportional to fluctuations in sales. In the case with no inconsistent fluctuation, sales and cost of sales increased by approximately the same amount (5.2 percent and 4.9 percent, respectively). However, in the case that included the inconsistent fluctuation, the increase in sales and cost of sales was disproportional (5.2 percent and 0.9 percent, respectively). This seeded condition resulted in an increase in gross profit that was inconsistent with information about unit sales prices, sales mix, and product costs. To increase salience, gross profit performance was stated to be an important measure in merger negotiations. We patterned these seeded conditions after the inconsistent fluctuation created by Bedard and Biggs (1991) that involved misallocation of overhead costs for a manufacturing client. For the grocer described in our case, this pattern of changes in two related accounts (sales and cost of sales) could, among other things, signal a misstatement that resulted from misallocation of distribution costs.

Experiment One

The first experiment employs a 2 × 2 between-subjects design. The presence or absence of the inconsistent fluctuation is one of the crossed factors. The other is whether participants perform strategic assessment before or after they perform analytical procedures. Misstatement risk assessment for cost of sales is the dependent variable. Including cases that did and did not contain inconsistent fluctuations provides a basis for (1) validating that the inconsistent-fluctuation manipulation increased account-level risk assessments, and (2) evaluating how the requirement to perform strategic assessment influenced account-level risk assessments for cases that did and did not contain an inconsistent fluctuation.

Procedure

Participants began phase one by answering questions about their auditing experience. Next, they read information about the audit engagement, control risk assessments, the client's industry, business operations, history with the firm, and key business processes. They reviewed a current-year balance sheet and income statement and then provided a baseline misstatement risk assessment for inventory, sales, cost of sales, and store expenses on a scale from 1 (low) to 7 (high). These pre-task assessments for account-level misstatement risk provided a metric (covariate) that was used to control for between-subject differences in misstatement risk expectations that existed prior to the experimental manipulations.

After providing pre-task risk assessments, participants who did not perform strategic assessment began phase two. Participants who performed strategic assessment were provided with two paragraphs of information that described the client's business strategy and explained how the client was attempting to execute the strategy. They were also provided with five key performance indicators that served as benchmarks for gauging how well the strategy was being accomplished. The five key performance indicators were taken from information about client operations that was provided to all participants when they assessed misstatement risk during phase two. Using a scale from 1 (low) to 7 (high), participants assessed the likelihood that the company would be able to execute its strategy successfully.

During phase two, all participants analyzed information about client operations and provided post-task risk assessments for inventory, sales, cost of sales, and store expenses on a scale from 1 (low) to 7 (high). Participants were asked to assess misstatement risk across four accounts to help disguise the seeded-inconsistency manipulation and reduce demand effects.

During phase three, strategic assessment was performed by all participants who did not complete that task during phase one. Next, all participants completed a debriefing questionnaire and were asked to provide their email address if they wanted a summary of the results. Responses to the debriefing questionnaire were used to check the validity of the case materials. Figure 1 illustrates the flow of tasks for this experiment.

Results

A total of 90 auditors with an average of 2.9 years of auditing experience (standard deviation = 1.3) participated in the first experiment. Most participants took about 45 minutes to complete the exercise and all finished within one hour. Descriptive statistics for all pertinent variables are presented in Table 1.

Before testing our hypotheses, we verified that the inconsistent fluctuation we seeded as one of our manipulations actually increased risk assessments for cost of sales. For the participants who performed analytical procedures on the case that contained the inconsistent

FIGURE 1
Flow of Tasks for Experiment One

	Strategic Risk Assessment	**No Strategic Risk Assessment**
Phase 1	Document pre-task misstatement risk assessments	Document pre-task misstatement risk assessments
	Perform strategic assessment	* * *
Phase 2	Perform analytical procedures and document misstatement risk	Perform analytical procedures and document misstatement risk
Phase 3	* * *	Perform strategic assessment
	Complete debriefing questionnaire	Complete debriefing questionnaire

TABLE 1
Means (Standard Deviations) for Measured Variables in Experiment One

	Variable	Inconsistent Fluctuation	No Inconsistent Fluctuation	Condition Means
Strategic assessment before analytical procedures	PreMR	4.4 (1.3)	3.8 (1.3)	4.1 (1.3)
	PostMR	4.2 (1.5)	3.6 (1.3)	3.9 (1.4)
	SRA	4.1 (1.1)	3.7 (1.2)	3.9 (1.1)
	Exp	2.8 (1.0)	2.7 (1.1)	2.8 (1.1)
		n = 24	n = 24	
Strategic assessment after analytical procedures	PreMR	4.5 (1.5)	3.8 (1.0)	4.1 (1.3)
	PostMR	5.2 (1.2)	3.7 (1.7)	4.4 (1.6)
	SRA	4.1 (1.1)	3.7 (1.3)	3.9 (1.2)
	Exp	3.2 (1.9)	2.8 (1.1)	3.0 (1.5)
		n = 20	n = 22	
Condition Means	PreMR	4.4 (1.4)	3.8 (1.1)	
	PostMR	4.6 (1.4)	3.7 (1.5)	
	SRA	4.1 (1.1)	3.7 (1.2)	
	Exp	3.0 (1.5)	2.8 (1.1)	

PreMR = pre-task misstatement risk assessment for cost of sales from 1 (low) to 7 (high);
PostMR = post-task misstatement risk assessment for cost of sales from 1 (low) to 7 (high);
SRA = strategic risk assessment from 1 (low) to 7 (high); and
Exp = years of auditing experience.

fluctuation, the average risk assessment for cost of sales was 4.7. However, for the participants who performed analytical procedures on the case with no inconsistent fluctuation, the average risk assessment for cost of sales was 3.7. The t-statistic for the difference between those means is 2.88, which is significant at the $p < .01$ level. It appears that, as intended, seeding the inconsistent fluctuation increased the level of misstatement risk that auditors associated with cost of sales.

Hypothesis Tests

Hypothesis 1 predicts that auditors who perform strategic assessment before analytical procedures will increase misstatement risk in the presence of an inconsistent fluctuation less than auditors who do not perform strategic assessment first. In other words, H1 predicts an ordinal interaction. The mean risk assessments for auditors who analyze the case with the inconsistent fluctuation but do not perform strategic assessment before analytical procedures should be greater than the mean risk assessments for auditors in the other three conditions.

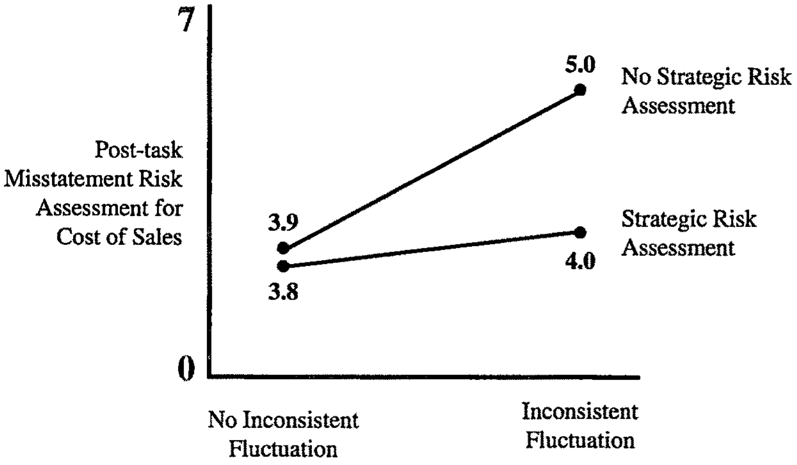
Buckless and Ravenscroft (1990) explain that, when using experimental designs involving this type of ordinal interaction, traditional analysis of variance does not provide the most powerful test of significance of the expected relationship among cell means. Therefore, we used the contrast coding approach that they recommend to test H1, which involves using pre-assigned weights for calculating the sum of squares for main and interactive effects. Our analysis, which is presented in Panel A of Table 2, indicates that the adjusted mean cost of sales risk assessments (5.0) for the group that analyzed the case with an inconsistent fluctuation but did not perform strategic assessment before analytical procedures is significantly greater than the mean assessments of the other three groups (see Panel B of Table 2). This finding suggests that auditors who performed strategic assessment before

TABLE 2
Summary for Planned Contrasts Used to Test the Influence of Strategic Assessment on Cost of Sales Risk Assessments

Panel A: Analysis of Covariance with Contrast Coding

Source of Variation	SS	df	MS	F-statistic	p-value[a]
Pre-task cost of sales risk assessment (covariate)	43.83	1	43.83	24.50	.0000
Model contrast (for pattern of interaction)[b]	17.59	1	17.59	9.83	.0024
Residual[c]	0.37	2	0.19	0.10	.9019
Error	152.09	85	1.79		

Panel B: Pattern of Interaction among Adjusted Cell Means



---

[a] All reported p-values are two-tailed.

[b] Contrast coefficients are 3 for the no strategic risk assessment-inconsistent fluctuation condition and −1 for the other three conditions.

[c] The residual sum of squares represents the between-group variance unexplained by the model contrast used to test H1. An insignificant p-value indicates that the model contrast and covariate explain all significant between-group variance in the data.

analytical procedures reacted less strongly to the inconsistent fluctuation than auditors who did not perform strategic assessment first, supporting H1.

Hypothesis 2 predicts that, when auditors perform strategic assessment before they perform analytical procedures on the case with an inconsistent fluctuation, their assessment of strategic risk will bias their assessment of misstatement risk for the account with the inconsistent fluctuation. In other words, because of the halo from strategic assessment, misstatement risk assessments for cost of sales should be positively correlated with strategic risk assessments.

On the other hand, when auditors perform strategic assessment before analytical procedures but do not encounter an inconsistent fluctuation, there should be no correlation between strategic risk assessments and misstatement risk assessments for cost of sales because auditors have no evidence that misstatement risk should be increased. When there is no evidence to interpret, there can be no potential for the halo effect to bias auditor judgment about that evidence. Also, when auditors do not perform strategic assessment before analytical procedures, there can be no halo from strategic assessment and, therefore, no correlation between strategic risk assessments and misstatement risk assessments for cost of sales. In other words, evidence supporting H2 would demonstrate a positive correlation between strategic risk assessments and misstatement risk assessments for cost of sales when participants performed strategic assessment before they performed analytical procedures on the case with the inconsistent fluctuation, but no such correlation for the other three experimental conditions.

To test H2, we calculated the change in misstatement risk assessments for cost of sales by subtracting pre-task assessments from post-task assessments, which allowed us to control for any between-subjects differences in misstatement risk expectations that existed before the task began. Next, we calculated Pearson correlations between strategic risk assessments and the change in misstatement risk assessments for cost of sales for participants in each of the four experimental conditions. Results presented in Table 3 reveal a significant ($p < .01$) positive correlation when participants performed strategic assessment before they performed analytical procedures on the case with the inconsistent fluctuation, but no significant correlation in the other three experimental conditions. These findings provide evidence that supports H2.

Additional Analyses

The auditors who participated in this study worked for a firm that requires them to perform strategic risk assessment before they analyze account-level misstatement risk. One explanation for our findings could be that participants who did not perform strategic risk assessment were more skeptical because they did not follow their normal routine. As a result, the unfamiliar task structure might have inspired a more rigorous analysis. We used data from the debriefing questionnaire to evaluate this possibility.

After participants completed their risk assessments, they responded to two questions about the case materials that they had evaluated. They were asked to rate the similarity between the format used to present information in this exercise and the format used by their firm's audit support software on a scale from 1 (not similar) to 7 (very similar). Average ratings for participants who performed strategic assessment were 3.5 compared to 3.6 for participants who did not perform strategic assessment. Participants were also asked to rate how well the information they examined during this exercise helped them to understand the business processes their client uses to create customer value on a scale from 1 (not well) to 7 (very well). Average ratings for participants who performed strategic assessment were 3.8 compared to 4.0 for participants who did not perform strategic assessment. t-tests indicate that performing strategic assessment had no significant influence

TABLE 3

Pearson Correlations between Strategic Risk and the Pre-Task to Post-Task Change in Cost of Sales Risk across Experimental Conditions

	Case with Inconsistent Fluctuation	**Case without Inconsistent Fluctuation**
Performed strategic assessment before analytical procedures	0.65 ($p = .00$)	0.25 ($p = .22$)
Performed strategic assessment after analytical procedures	0.23 ($p = .32$)	0.09 ($p = .65$)

on either of these ratings, which suggests that familiarity with the task structure did not influence the results.

Another explanation for our findings is that auditors who performed strategic assessment were more fatigued when they performed analytical procedures and did not put forth as much effort as auditors who were not required to perform strategic risk assessment first. Participants completed the experimental task in less than an hour, immediately after returning from a break. It is unlikely that experienced auditors who perform this type of analysis on a regular basis were particularly fatigued after analyzing one page of information and the five key performance indicators provided for strategic assessment. We tested this alternative explanation by having auditors who did not perform strategic assessment before analytical procedures perform strategic assessment during phase three (see Figure 1).

During strategic assessment, all auditors were required to document the rationale for their conclusions. There was no significant difference (p = .38) between the number of words used in the documentation provided by auditors who performed strategic assessment before analytical procedures (mean = 38 words; standard deviation = 28 words) and auditors who performed strategic risk assessment after analytical procedures (mean = 34 words; standard deviation = 17 words). There also was no significant difference (p = .77) in average strategic risk assessments between these two groups. These findings indicate that fatigue did not affect our results.

Discussion

Our findings suggest that performing strategic assessment can bias auditor judgment about the risk associated with evidence that manifests in accounting details. In experiment one, (1) auditors who performed strategic assessment were less likely to adjust their account-level risk assessments in the presence of an inconsistent fluctuation than auditors who did not perform strategic assessment, and (2) holistic judgments about strategic risk biased auditor judgment about inconsistent accounting details. Auditors who assessed strategic risk at lower levels also assessed misstatement risk for the account with an inconsistent fluctuation at lower levels, even though strategic risks had no direct implications for inconsistent fluctuations in that account. These results suggest that a widely used auditing procedure, which is becoming institutionalized in practice, may impair auditor judgment.

Because strategic assessment can enhance auditor judgment in many ways (Bell et al. 2002), the question is not whether auditors should perform strategic assessment. Instead, the issue is how to mitigate the undesirable effects of the halo that strategic assessment can create. We are reluctant to propose future research on the halo effect based on findings from a single experiment, and without learning more about how the halo effect influences auditor cognition. Therefore, we conducted a second experiment to determine how the halo effect influences account-level risk assessments. Experiment two also replicates evidence that the halo effect influences auditor judgment about the level of misstatement risk associated with inconsistent fluctuations and provides evidence about the external validity of our findings.

Experiment Two

In this experiment, participants assessed account-level misstatement risk over two consecutive years for the same client's audit. Account balances for year one contained no inconsistent fluctuations. However, for year two, sales increased by 3.2 percent while cost of sales increased by only 0.9 percent, which provided an inconsistent fluctuation similar to the seeded condition used in experiment one.[1]

For both years, participants were instructed to assume that the engagement partner had conducted the strategic assessment and they were provided with a summary of his conclusions. All participants received the same strategic assessment summary for the first year, but we manipulated the strategic assessment summary for the second year to be either favorable or unfavorable.[2] For the first year, information provided to all participants indicated that (1) the client had changed its strategy during the year, (2) sales revenue and market share had not significantly changed, (3c) net income had remained relatively stable, and (4) the engagement partner had concluded it was still too early to develop any meaningful assessment about the viability of the new strategy.

For the second year, participants assigned to the low strategic risk (favorable halo) condition received information that the engagement partner believed the new strategy may achieve the results that the client intended, that sales growth for the second year was 3.2 percent while the average sales growth in the client's market was only 1.9 percent, that net income had increased by 1.8 percent, and that the client had increased its market share. Second-year information provided to participants assigned to the high strategic risk (unfavorable halo) condition indicated that the engagement partner believed the new strategy may not achieve the results that the client expected, that sales growth during the second year was only 3.2 percent while the average sales growth in the client's market was 4.5 percent, and that although net income had increased by 1.8 percent, the client had lost market share.

Procedure

The experiment involved three phases. During phase one, participants were provided with information about (1) overall engagement risk, (2) business strategy (including information about strategic risk), (3) business process analyses, and (4) control risk assessments. This information was patterned after the documentation provided by the audit support software that participants use in the field. Next, they were provided with comparative account balances and key performance indicators for the first year and the previous year (including the amount and percent of change) and asked to assess misstatement risk for inventory, sales, cost of sales, and store expenses. Participants used a scale where 0 indicated very low risk and 100 indicated very high risk. After documenting their expectations, participants sealed phase one materials in an envelope and began phase two.

During phase two, participants were told to assume that they had returned to audit the same client for the following year, that the audit for the previous year had gone smoothly, there had been no proposed adjusting entries, and the client had received an unqualified opinion. They were provided with information about strategic risk (either high or low).

---

[1] An expert panel validated our inconsistent fluctuation manipulation. We asked audit partners from four of the former Big 5 firms (minimum experience of eight years as an audit partner) to complete the case exercise that included the favorable strategic risk assessment. All four increased misstatement risk for cost of sales during the second year (two by 15 and two by 10). The average increase for cost of sales was larger than the increases for the other three accounts (average risk increases from the first year to the second were 1.6 for sales, 8.8 for store expenses, 10.0 for inventory, and 12.5 for cost of sales).

[2] We used this approach to stabilize between-subjects strategic risk assessments. Even when provided with the same information for strategic assessment, participants in the first experiment who performed strategic assessment prior to analytical procedures assessed strategic risk from 1 to 6 (on a scale from one to seven), resulting in with a standard deviation of 1.1.

Materials indicated that there were no significant changes in business processes or management personnel, and that unit sales prices, sales mix, and product costs remained stable. Case materials also indicated that engagement risk had increased from 25 to 35 (on a scale from 0 to 100) because the client was currently engaged in merger negotiations and that control risk had increased from 20 to 25 (on a scale from 0 to 100) because the client had implemented a significant upgrade to its supply chain management software. We included these conditions to increase participants' focus on risk factors during analytical procedures.

After reading information about the second year, participants indicated whether they expected balances for inventory, sales, cost of sales, and store expenses to decrease, not change, or increase, and documented their expectations on a scale from 1 (decrease significantly) to 7 (increase significantly). McDaniel and Kinney (1995) used this procedure to increase auditor attention to fluctuations in account balances during analytical procedures. We included the task to (1) increase the likelihood that participants would notice the inconsistent fluctuation and (2) provide metrics for evaluating whether strategic risk influences auditor expectations about changes in account balances. After documenting their expectations, participants were provided with second-year balances for the metrics they analyzed and asked to provide misstatement risk assessments for inventory, sales, cost of sales, and store expenses using a scale from 0 to 100. Next, for each of the four accounts, participants were asked to indicate whether they expected the amount of time spent gathering and evaluating evidence to substantiate the account balance to decrease, not change, or increase compared to year one. If they expected the amount of time to change, then participants were also asked to indicate the percent of increase or decrease in audit effort.[3]

During phase three participants answered debriefing questions, completed a surprise recognition task, and were given an opportunity to provide their email address if they wanted a summary of the results. The surprise recognition task provided data for differentiating levels of attention (a proxy for cognitive effort) across the experimental conditions (Libby and Trotman 1993). In multiple-choice format, participants were asked to indicate the change in inventory, sales, cost of sales, and store expenses from the first year to the second year. They were provided with the same five answer choices for each question, four of which represented the actual fluctuations in the accounts they had evaluated (inventory was 1.8 percent, sales was 3.2 percent, cost of sales was 0.9 percent, store expenses was 2.7 percent). The fifth choice was 3.0 percent.

Results

A total of 48 auditors participated in the second experiment. Participants took about 25 minutes to complete the exercise and all finished within 40 minutes. Descriptive statistics are presented in Table 4.

Before analyzing our findings, we checked our favorable versus unfavorable halo manipulation using our auditors' rating of strategic risk. In the debriefing questionnaire, participants were asked to provide their judgment that the client's business strategy would succeed on a scale from 1 (not likely) to 7 (very likely). Mean success ratings for participants in the unfavorable halo condition were 3.0, while mean success ratings for participants in the favorable halo condition were 4.4 ($t = 4.13$, $p < .01$). It appears that our halo manipulation worked as intended.

---

[3] We verified that participants' account-level misstatement risk assessments reflected their expectations about the audit effort needed to substantiate the cost of sales account balance, proxied by time budgeted for auditing procedures. The Spearman correlation between change in risk assessment and anticipated audit effort for cost of sales during year two is 0.28 ($p = .05$).

TABLE 4
Means (Standard Deviations) for Measured Variables in Experiment Two

Variable	Favorable Halo (n = 25)	Unfavorable Halo (n = 23)	Full Sample
ΔMR	1.0 (17.1)	13.3 (13.7)	6.9 (16.6)
ΔAE	14.4 (13.8)	16.3 (10.9)	15.3 (12.3)
Exp	2.4 (0.8)	2.8 (1.0)	2.6 (0.9)

ΔMR = change in misstatement risk assessment for cost of sales between years (year two minus year one) measured on a scale from 0 (low) to 100 (high);
ΔAE = percent change in anticipated audit effort for cost of sales (increase or decrease in budgeted hours for substantive tests) from year one to year two; and
Exp = years of auditing experience.

Our second hypothesis predicts that auditors who believe strategic risk is low (favorable halo) will rate account-level misstatement risk for accounts with inconsistent fluctuations at lower levels than auditors who believe that strategic risk is high (unfavorable halo). We calculated the amount by which cost of sales risk (rated on a scale from 0 to 100) changed from year one to year two. As shown in Table 4, the average within-subjects increase in cost of sales risk assessments for auditors in the favorable halo condition was 1.0 compared with 13.3 for auditors in the unfavorable halo condition ($t = 2.73$; $p < .01$). Experiment two replicates support for our second hypothesis by providing evidence that the favorable versus unfavorable nature of strategic risk assessments can bias misstatement risk assessments for accounts with unexpected fluctuations.

Additional Analyses

Our research hypotheses predict that, when auditors perform strategic assessment, they base diagnostic judgments during analytical procedures more on strategic risk assessments and less on evidence provided by fluctuations in accounts. These hypotheses predict that the halo associated with strategic assessment diminishes the diagnostic relevance of account-level evidence and, as a result, auditors are more tolerant of inconsistent fluctuations. However, the effects predicted by our research hypotheses could also be explained by two other conditions, which we examine to provide a more complete test of halo theory.

First, halo theory predicts that holistic evaluative judgments decrease the extent to which detailed performance measures influence performance evaluation, but do not decrease rater attention to detailed performance measures (Lance et al. 1994). However, it is possible that auditors who rely on the evaluative judgments developed during strategic assessment may devote less attention to analyzing accounting details. If so, then they may overlook inconsistent fluctuations entirely rather than, as predicted by halo theory, attend to them but put little weight on them. We tested this alternative explanation using participants' ability to remember evidence that they examined, which served as a proxy for their level of attention (Birnberg and Shields 1984).

During the surprise recognition task administered in phase thee, participants were asked to identify the percent change in accounts they analyzed during analytical procedures. We calculated Chi-square statistics (with one degree of freedom) for the difference between participants who remembered correctly in the favorable and unfavorable halo conditions. Of the 48 participants across both conditions, 73 percent correctly identified the change in sales (Chi-square = 1.32; $p = 0.24$), 48 percent correctly identified the change in cost of sales (Chi-square = 0.00; p = 0.99), 52 percent correctly identified the change in inventory (Chi-square = 1.31; p = 0.25), and 46 percent correctly identified the change in store expenses (Chi-square = 0.79; p = 0.37). These findings suggest that our halo manipulation did not influence the amount of attention that participants devoted to analyzing fluctuations in accounts, which is consistent with halo theory.

A second alternative to halo theory is that auditors who develop favorable evaluative judgments during strategic assessment develop expectations about changes in account balances that differ from auditors who do not. During analytical procedures, the primary diagnostic for determining inconsistent fluctuations is the difference between the account balance that the auditor expects and the account balance that the auditor observes (Koonce 1993). If the fluctuations that auditors expect are closer to fluctuations that they actually observe, then the likelihood that a fluctuation will be construed as inconsistent should diminish.

To evaluate this alternative explanation, we used documentation that participants provided before they performed analytical procedures to test whether performing strategic assessment influenced participants' expectations about changes in accounts. On average, participants in the favorable halo condition rated their expectations about the change in cost of sales at 4.5 and participants in the unfavorable halo condition rated their expectations at 4.6 (t = 0.44; p = 0.66). These findings suggest that the halo from strategic assessment had no influence on auditor expectations about the size of interperiod fluctuations in accounts, and again contribute positively to the applicability of halo theory.

These findings provide insight about the cognitive mechanism through which a halo effect biases auditor judgment about misstatement risk. It appears that, consistent with halo theory, holistic judgment about strategic risk biases account-level risk assessments by diminishing the diagnostic value of evidence from accounting details. Because auditors in both the favorable and unfavorable halo conditions analyzed changes in accounts with similar levels of effort and against similar expectations about the size of interperiod fluctuations, we find no evidence that the association between strategic risk assessments and account-level risk assessments can be attributed to differences in auditor effort or attention to accounting details or auditor expectations about interperiod fluctuations in account balances.

Discussion

Results from experiment two provide additional evidence in support of halo theory. Analyses confirm H2, this time using an inherited strategic assessment risk from the engagement partner. Auditors who received lower (higher) evaluations of strategic risk rated account-level risk at lower (higher) levels. Also, consistent with halo theory, strategic risk assessments apparently influence auditor judgment about the risk associated with changes in accounts by altering their tolerance for unexpected fluctuations.

IV. SUMMARY

This study used halo theory to examine the effects that performing strategic assessment have on auditors' analytical procedures judgments about the misstatement risk associated with inconsistent fluctuations. Halo theory supports propositions that auditors' developing or inheriting high-level performance-related judgments (strategic risk assessments) prior to evaluating more detailed performance measures (changes in account balances) will reduce their use of the diagnostic information contained in the more detailed measures. Our results suggest that account-level risk assessments were not sensitive to inconsistent fluctuations in account balances when auditors performed a strategic assessment before they performed analytical procedures. Our results also provide evidence of a positive relationship between strategic risk assessments and account-level risk assessments for accounts containing inconsistent fluctuations. These findings, if substantiated, indicate that auditors may underestimate the risk of financial misstatement when they assess strategic risks at lower levels based on the viability of their clients' business models.

These results must be interpreted with care. Although the auditors who participated in this study were provided with an opportunity to develop comprehensive evaluations, they did not perform strategic assessment with the degree of rigor that would be applied in the field. Another significant difference between audit practice and our experimental setting is the level of expertise that was brought to bear on the risk assessment process. In this study, senior-level auditors performed analyses and made the type of decisions they are responsible for in the field. However, in practice, their conclusions are scrutinized by managers and partners who are more likely to recognize patterns of account balances that represent inconsistent fluctuations (Bonner and Lewis 1990).

Both audit practice and the audit judgment literature could benefit from research that examines how alternative task structures influence the interaction between strategic risk assessment and analytical procedures. For example, research has shown that changing the way information is organized and presented during diagnostic auditing tasks can alter judgment (Ricchiute 1992) and help auditors recognize risk factors (O'Donnell and Schultz 2003). Altering task structures to direct auditor attention toward specific information can increase the extent to which that information influences audit judgment tasks (Knapp and Knapp 2001). Our results support the need for methods designed to increase the salience of evidence that manifests in detailed accounting information. Given the increasingly widespread adoption of the business risk approach, we believe that research on the business risk approach in general and strategic assessment in particular could help audit practitioners develop and use information about strategic risks more effectively.

REFERENCES

American Institute of Certified Public Accountants (AICPA). 2001. *Professional Standards.* Volume 1. U.S. auditing standards as of June 1, 2001. New York, NY: AICPA.

———. 2002. *Understanding the Entity and Its Environment and Assessing the Risks of Material Misstatement.* Exposure draft for proposed statements on auditing standards issued by the Auditing Standards Board on December 2, 2002. New York, NY: AICPA.

Ballou, B., and D. Heitger. 2004. A cognitive characterization of audit analytical procedures under strategic systems auditing. Working paper, Miami University.

Balzer, W., and L. Slusky. 1992. Halo and performance appraisal research: A critical examination. *Journal of Applied Psychology* 77: 975–985.

Bamber, M., and J. Bylinski. 1987. The effects of planning memorandum, time pressure, and individual auditor characteristics on audit managers' review time judgments. *Contemporary Accounting Research* 4 (Spring): 127–143.

Bedard, J., and S. Biggs. 1991. Pattern recognition, hypothesis generation and auditor performance in an analytical task. *The Accounting Review* 66 (July): 622–642.

Bell, T., F. Marrs, I. Solomon, and H. Thomas. 1997. *Auditing Organizations Through a Strategic-Systems Lens.* New York, NY: KPMG Peat Marwick, LLP.

———, M. Peecher, and I. Solomon. 2002. The strategic-systems approach to auditing. In *Cases in Strategic-Systems Auditing,* edited by T. Bell, and I. Solomon, 1–34. New York, NY: KPMG, LLP.

Birnberg, J., and M. Shields. 1984. The role of attention and memory in accounting decisions. *Accounting, Organizations and Society* 9 (3–4): 365–383.

Bonner, S., and B. Lewis. 1990. Determinants of auditor expertise. *Journal of Accounting Research* 28 (Supplement): 1–20.

Cohen, J., and T. Kida. 1989. The impact of analytical review results, internal control reliability, and experience on auditors use of analytical review. *Journal of Accounting Research* 27 (Autumn): 263–276.

Devine, P., E. Hirt, and E. Gehrke. 1990. Diagnostic and confirmation strategies in trait hypothesis testing. *Journal of Personality and Social Psychology* 58 (6): 952–963.

Eilifsen, A., R. Knechel, and P. Wallage. 2001. Application of the business risk audit model: A field study. *Accounting Horizons* 15 (September): 193–208.

Finucane, M., A. Alhakami, P. Slovic, and S. Johnson. 2000. The affect heuristic in judgments of risks and benefits. *Journal of Behavioral Decision Making* 13 (1): 1–17.

Glater, J., and K. Eichenwald. 2002. Turmoil at WorldCom: The accounting. *New York Times* (June 28).

Glover, S. M., D. F. Prawitt, M. F. Zimbelman, and J. J. Schultz, Jr. 2003. A test of changes in auditors' fraud-related planning judgments since the issuance of SAS No. 82. *Auditing: A Journal of Practice & Theory* 22 (September): 237–252.

Greenwood, R., and S. Salterio. 2002. Loblaw Companies, Ltd. In *Cases in Strategic-Systems Auditing*, edited by T. Bell and I. Solomon, 165–210. New York, NY: KPMG, LLP.

Kaplan, R., and D. Kiron. 2004. *Accounting Fraud at WorldCom.* Business School Case #9-104-071. Cambridge, MA: Harvard University Press.

Kinney, W. R., Jr., and W. L. Felix. 1993. Implementing SAS No. 55: An interim report. In *The Expectation Gap Standards: Progress, Implementation Issues, Research Opportunities.* New York, NY: AICPA.

Knapp, C., and M. Knapp. 2001. The effects of experience and explicit fraud risk assessment in detecting fraud with analytical procedures. *Accounting, Organizations and Society* 26 (1): 25–37.

Koonce, L. 1993. A cognitive characterization of audit analytical review. *Auditing: A Journal of Practice & Theory* 12 (Supplement): 57–76.

Lance, C. J. LaPointe, and S. Fisicaro. 1994. Tests of three causal models of halo rater error. *Organizational Behavior and Human Decision Performance* 57: 83–96.

Lemon, M., K. Tatum, and W. Turley. 2000. *Developments in the Audit Methodologies of Large Accounting Firms.* London, U.K.: ABG Professional Information.

Libby, R., and K. T. Trotman. 1993. The review process as a control for differential recall of evidence in auditor judgments. *Accounting, Organizations and Society* 18 (6): 559–574.

McDaniel, L., and W. Kinney. 1995. Expectation-formation guidance in the auditor's review of interim financial information. *Journal of Accounting Research* 33 (Spring): 59–76.

Murphy, K., R. Jako, and R. Anhalt. 1993. Nature and consequences of halo error: A critical analysis. *Journal of Applied Psychology* 78 (2): 218–225.

Nisbett, R., and T. Wilson. 1977. The halo effect: Evidence for unconscious alteration of judgments. *Journal of Personality and Social Psychology* 35: 250–256.

O'Donnell, E., and J. J. Schultz, Jr. 2003. The influence of business-process-focused audit support software on analytical procedures judgments. *Auditing: A Journal of Practice & Theory* 22 (September): 265–280.

Phillips, F. 1999. Auditor attention to and judgments of aggressive financial reporting. *Journal of Accounting Research* 37 (Spring): 167–190.

Ricchiute, D. 1992. Working-paper order effects and auditors' going-concern decisions. *The Accounting Review* 67 (January): 46–58.

Slovic, P., M. Finucane, E. Peters, and D. MacGregor. 2002. Rational actors or rational fools: Implications of the affect heuristic for behavioral economics. *Journal of Socio-Economics* 31: 329–342.

Thorndike, E. 1920. A constant error in psychological ratings. *Journal of Applied Psychology* 4: 25–29.

Wilks, T. 2002. Predecisional distortion of evidence as a consequence of real-time audit review. *The Accounting Review* 77 (January): 51–71.

THE ACCOUNTING REVIEW
Vol. 80, No. 3
2005
pp. 941–966

The Information Intermediary Role of Short Sellers

Grace Pownall
Emory University

Paul J. Simko
University of Virginia

ABSTRACT: This paper examines the conditions under which the market responds to disclosures of significant increases in short selling, and whether proxies for earnings expectations and alternative information sources help explain this response. Our sample is based on firms that experience abnormal short interest increases ("short spikes") during 1989–1998. We find that the mean abnormal return around short spike announcements is significantly more negative for firms with low analyst following, consistent with short sellers providing perceived value when there are limited alternative sources of guidance available. For firms with high analyst following we find the market response is dependent on earnings levels, consistent with investors viewing a short interest increase as providing information about the sustainability of earnings. Additional analyses reveal that these inferences are not affected by measures of firms' earnings quality or by the relative size of the short spike. We infer from our analyses that the information content of short interest disclosures is conditional on both the firms' existing information environment and expectations of future performance as conveyed by prior earnings. This inference is consistent with short sellers' role as information intermediaries covering the lower tail of earnings expectations.

Keywords: *short selling; financial analysts; financial analysis.*

Data Availability: *All data are available from public sources.*

I. INTRODUCTION

Financial analysts play a critical role in financial markets by interpreting, processing, and forecasting accounting information. Their tendency to provide earnings forecasts only when they have positive expectations, however, implies that the distribution of observed earnings expectations has been censored at the lower tail; analyst guidance on

---

We are grateful to the New York Stock Exchange for providing the short interest data used in this paper, and to Sudipta Basu, Jennifer Francis, Carla Hayn, Elizabeth Keating, Patricia O'Brien, Katherine Schipper, Nicholas Valerio, Greg Waymire, an anonymous referee, an anonymous hedge fund manager, workshop participants at the Middle States Accounting Research Symposium, the Southeast Summer Accounting Research Colloquium, London Business School, Emory University, Virginia Commonwealth University, and Northwestern University, and the Universities of Houston, Waterloo, and Wisconsin for helpful comments. The Goizueta Business School of Emory University and the Darden Graduate School of Business at the University of Virginia provided generous financial support for this research.

Editor's note: This paper was accepted by: Terry Shevlin, Senior Editor.

Submitted January 2003
Accepted November 2004

firms with negative prospects is notably limited (McNichols and O'Brien 1997). This paper investigates the extent to which short sellers are complementary information intermediaries who help fill this void through their *ex post* observable trades, in contrast to sell-side analysts issuing forecasts, recommendations, and research reports. We specifically examine the conditions under which the market responds to disclosures of significant increases in short selling, and whether alternative information sources and proxies for earnings expectations help explain this response.

Short sellers take positions to benefit from anticipated stock price declines. The disclosure of an unexpected short position, therefore, is a proxy for the information-processing and forecasting activities undertaken by the short seller. This perspective is based on short sellers putting their capital at risk, the significant information search activities that typify short selling (Staley 1997), and the costs short sellers bear beyond those associated with conventional long positions (Diamond and Verrecchia 1987). Recent research documents that high levels of short interest are associated with negative future returns (Asquith and Meulbroek 1996) and that firms with weak fundamentals are associated with high levels of short interest (Dechow et al. 2001). In contrast, however, other evidence is inconclusive regarding the informativeness of new short positions and, in fact, suggests investors ignore the negative information embedded in short sales (e.g., Senchack and Starks 1993). Taken together these findings leave open the questions of how and when investors respond to the information conveyed by new short positions. Our study addresses these questions by evaluating the response to short-selling signals as dependent on both the firm's existing information environment and its observable fundamentals.

Our sample is based on 2,304 instances from 1989 through 1998 in which NYSE-listed firms experienced abnormal increases in short interest (i.e., a "short spike"), not likely related to positions designed to hedge anticipated interest rate changes or regulatory outcomes. Descriptive evidence indicates that, relative to the NYSE population, firms experiencing a short spike tend to be smaller, with higher earnings prior to the announcement of the short spike. The mean abnormal return around the short spike announcements is negative but modest, consistent with Senchack and Starks (1993) in an earlier study period. From the perspective that the short seller serves as an information intermediary for other investors, a short spike is expected to be a negative information event, analogous to a "sell" recommendation supported by an observable investment by the short seller. The small negative average abnormal return is of particular interest as it suggests that short spikes either have no information content, or that investors react conditionally to their disclosure.

In our primary tests we investigate specific firm characteristics that we posit will help describe the response to short spikes. McNichols and O'Brien (1997) document that analyst coverage declines when analysts have low expectations, while Ayers and Freeman (2003) find that stock prices incorporate information about future earnings more slowly for firms with lighter analyst following. One implication of these studies is that alternate sources of information take on increasing importance as analyst coverage declines. We examine whether short sellers serve a more meaningful role as information intermediaries for firms with limited analyst following and, accordingly, whether the informativeness of short interest is higher for these firms. We also examine whether the strength of the short-selling signal is increasing in the level of firms' reported earnings given that earnings is arguably the most important contemporaneous performance metric associated with the market's expectation of future returns. Additional controls include proxies for weak accounting fundamentals (Lev and Thiagarajan 1993; Abarbanell and Bushee 1997), price bubbles (Staley 1997; Asensio 2001), and the expected costs of short selling (Senchack and Starks 1993; Desai et al. 2002; Diamond and Verrecchia 1987).

Our results indicate a significantly more negative market response to short spikes for firms covered by no more than one analyst, and for these firms only the presence of a significant price run-up two and three months before the short spike (our proxy for a stock price bubble) is consistently associated with the announcement response. In contrast, for firms with higher analyst following we find the market response more dependent on the level of earnings. Specifically, returns are negatively related to earnings from the quarter before the short spike (scaled by price), consistent with investors viewing the new short position as providing information regarding the sustainability of those firms' earnings. Subsequent analyses indicate that our findings are not driven by either the quality of firms' earnings or the materiality of the short position (Richardson 2003). Specifically, we partition firms' earnings into their accrual and cash flow components and find each equivalently explains the market's response to a short spike, but only for firms with higher analyst following. We observe no relation between abnormal announcement returns and earnings, cash flows, or accruals for firms with low analyst following. Confining the sample to only those firms with high levels of short interest reinforces our conclusions. The explanatory power of our models improves and we find the market response is even more negative for firms with low analyst following and high levels of short interest.

Our final test examines whether these same factors, as well as the announcement period response, describe short seller profitability. Prior research has documented that average returns subsequent to increases in short interest are negative (i.e., the short position is profitable to the short seller). For our sample of short spikes we also find evidence that short selling is profitable, with mean cumulative returns from the announcement date to the date the position closed consistently negative. We find that the initial market response to the short spike is related to the cumulative holding period return to short sellers but, in contrast, short seller profitability does not unconditionally vary across securities with low and high analyst coverage. However, when analyst coverage is high, the level of earnings and earnings changes is associated with short seller returns, providing some evidence that short sellers are able to identify firms with unsustainable earnings even when those firms are followed by analysts.

Taken as a whole, we infer that the information content of short interest disclosures is conditional on firms' information environment, consistent with investors viewing short spikes as informative signals. Beyond extending prior research that has had mixed success at documenting such effects, the important contextual feature of our analyses is that the market response is conditional on the information environment of the firm sold short, corroborating prior research that finds firms more heavily followed by analysts are priced on a more timely basis (Ayers and Freeman 2003; Brennan et al. 1993). We conclude that short sellers serve as important information intermediaries, with their perceived value highest when there are limited alternative sources of guidance.

The rest of the paper is organized as follows. In Section II, we discuss the institutional background of short selling and the primary hypotheses. The sample and research design are described in Section III. Results and diagnostics are reported in Sections IV and V. Section VI provides a summary.

II. BACKGROUND AND HYPOTHESES

Short Selling Overview

Rule 3b-3 of the Securities Exchange Act of 1934 defines a short sale as "any sale of a security which the seller does not own or any sale which is consummated by the delivery of a security borrowed by, or for the account of, the seller." Securities sold short are first borrowed, typically from a broker-dealer or an institutional investor, with the position later closed by returning the security to the lender after repurchase on the open market.[1] The expected benefits of short selling depend on the reason for selling the securities short. In general, however, short sellers expect to profit from a future price decline or to hedge the risk of a long position in the same or a related security.

Short sellers incur significant costs. These costs are beyond those associated with conventional long positions and help define why short sellers are commonly perceived to be informed and sophisticated investors (Dechow et al. 2001).[2] The first cost borne by short sellers relates to the risk of the short sale itself. Because the short sale precedes a purchase, the purchase price is not fixed and there exists a theoretically unlimited downside loss. The timing of the purchase and sale also serve to constrain the maximum available profit to the original sales price of the stock. A set of trading constraints arise from the regulatory restrictions unique to short selling.[3] As examples, the SEC (1999) and the NYSE (1997) prohibit short selling except on a plus tick or a zero plus tick, limiting potential returns in a falling market (SEC Rule 10a-1 and NYSE Rule 440B). The Federal Reserve Board's Regulation T mandates that short sellers retain 1.5 times the current market value of most securities sold short on margin until the shorted securities are replaced in the account from which they were borrowed.[4] The short seller does not have access to the proceeds of the short sale to offset these margin requirements, and only a small fraction of the return on the margin collateral is earned.[5] The availability of shares to short is another risk for the short seller. Securities that are scarcer in the equity-lending market (e.g., typically those with lower market capitalization or those with lower share turnover) are more expensive to borrow (Reed 2001). Scarce securities also expose the short seller to the risk of being caught in a "short squeeze" if a lender demands the securities back as prices rise and a sufficient number of shares are not available to cover the short position.

Short traders take their positions for a variety of reasons, several of which are for hedging purposes and unrelated to more conventional shorts based on firm-specific information (Dechow et al. 2001; SEC 1999; Senchack and Starks 1993). The prevalence of hedging strategies increased dramatically during the 1990s.[6] As examples, one form of this strategy is "pairs trading," a short position to hedge the risk of a long position taken in a different (but related) firm. It is also common for some traders to purchase shares of a merger target while selling short the bidder's shares. Alternatively, some traders take short positions in a takeover target when they believe it is unlikely that the firm will be acquired. Finally, short positions can be hedges against options exposures, commodity price risks, interest rate sensitivity, and/or expected regulatory changes.[7]

---

[1] D'Avolio (2002) and Reed (2001) describe the equity lending market in further detail. The former, in particular, provides a comprehensive empirical analysis of the market for borrowing stock.

[2] The constraints on short sellers represent the cumulative risks, costs, and restrictions unique to this type of trading. See Jones and Lamont (2002), among others, for a more thorough description of short selling constraints.

[3] For over 60 years the SEC, the exchanges, and the Federal Reserve Board have regulated short selling. The justification for these regulations is that short selling may be used to manipulate stock prices. These fears date back at least to the 1929 stock market crash and the market's sustained inability to recover from the crash amid allegations of "bear raids," in which securities were allegedly sold short to drive down price by creating an imbalance of sell orders in the market (see SEC 1999).

[4] The NYSE also imposes a 30 percent margin maintenance requirement on short sellers, but typically the brokers' margin requirements (which vary among brokerage firms) are more stringent than the exchange requirements.

[5] This earned return is called a "rebate rate." The rebate rate depends upon the market interest rate and supply and demand conditions for the borrowed securities. The return on the margin collateral after payment of the rebate is split between the beneficial owner of the securities (the client) and the lender (the broker). Reed (2001) quotes Bargerhuff & Associates in their "Securities Lending Analytics" for the 2nd quarter of 2000 as asserting that a 75/25 percent client/lender fee split is typical according to industry statistics, making equity lending a very profitable business in which a securities brokerage can engage. Fabozzi (1997) and Reed (2001) describe the equity lending market in further detail.

[6] The hedge fund industry has experienced significant growth in both the number of hedge funds and the amount of assets under management, with current estimates of 6,000 to 7,000 U.S. hedge funds managing $600 to $650 billion in assets (SEC 2003). To put this in perspective, the Commission estimated that in 1992, based on media reports, there were approximately 400 hedge funds in the U.S. In the coming decade hedge fund assets are expected to exceed $1 trillion.

Analyst Coverage and Investor Response to Short Selling

Despite imposing regulatory constraints on short-selling activity, the SEC notes that short sellers are information intermediaries who contribute to market efficiency because their search and processing activities inform the capital market of potential overvaluation (SEC 1999). In the absence of short selling it is widely accepted that securities can be overvalued because all negative expectations are not impounded in price. A number of studies support this conclusion. Miller (1977) shows that when constraints on short selling exist, the marginal investor will be an optimist. Diamond and Verrecchia (1987) formally model how short sale constraints impede private, negative information flow, and thus securities for which short selling is costly will be overvalued. Jones and Lamont (2002) find evidence that stocks that are expensive to short generate low subsequent returns, consistent with the hypothesis of overvaluation.

The constraints on short selling serve not only to reinforce the notion that short sellers are sophisticated investors, but also that their trades should help improve security prices and that revelations of their trading activity should be informative to other market participants. Financial analysts, as a more conventional group of information intermediaries, would be expected to limit security mispricing if they engaged in complete, accurate, and unbiased forecasting. McNichols and O'Brien (1997), however, document analysts' tendency to provide earnings forecasts and recommendations much more frequently when they have positive, rather than negative, expectations. As a consequence, the observable distribution of analyst earnings expectations is biased upward, and analyst guidance is limited for some firms.

The level of analyst coverage has direct implications for how investors use announcements of short sellers' trading activity. The signal should be strongest for firms with limited analyst following (1) because the short spike confirms the reason for the absence of analyst coverage, and (2) because there are few competing sources of information available to the market. That is, revelations of short sales resolve some uncertainty regarding analysts' undisclosed expectations. In addition, prices of firms followed by analysts tend to reflect information earlier than "neglected" firms due to analysts' search activities (Ayers and Freeman 2003), and the informativeness of the short spike should be at its highest when such search activities have not occurred. More formally, we propose and test the following hypothesis (stated in alternative form):

> **H1:** The market response to spikes in short interest is more negative for firms with limited analyst following.

In addition to considering analyst coverage and its relation to the market response to spikes in short interest, we also consider how existing expectations influence that response. Short sellers take non-hedging positions because firm-specific information suggests to them that the firm is overvalued. Staley (1997, 4–9) considers information-based short positions to include those based on predictions of future stock price declines due to (1) accounting manipulation (e.g., overstated earnings), (2) speculative price "bubbles" (e.g., high prices relative to fundamentals as alleged for Internet stocks in early 2000), and/or (3) increased likelihood of changes in the firm's external environment (e.g., firms selling "fad" products expected to experience a decline in demand and profits). She further asserts that information used by short sellers is already in the public domain, especially in various SEC filings.

---

[7] The tendency for noninformation-based short selling to increase over time is not universal. For instance, the IRS has tried to restrict certain tax-based incentives for short selling. Thus, certain strategies such as dividend capture strategies or "selling against the box" were eliminated in many circumstances by the Taxpayer Relief Act of 1997 (see CCH 1997a, 1997b).

Recent research lends empirical validity to these claims. In a survey of nine large hedge funds, Dechow et al. (2001) document that hedge fund managers short securities based on the belief that the relation between accounting fundamentals and price lead to temporary mispricing. In their empirical tests Dechow et al. (2001) examine whether certain accounting-based fundamentals help explain the observed level of short interest. They find that short interest levels coincide with low fundamental-to-price ratios, with short sellers later covering their positions as these ratios revert to higher levels. Not all firms with weak fundamentals, however, are reasonable candidates for a short sale. Richardson (2003) uses high accruals as a proxy for low-quality earnings, and finds that short sellers do not appear to target firms with low earnings quality. His findings are consistent with short sellers potentially avoiding stocks that are costly to short, as high-accrual firms tend to be those that are smaller and less liquid.

These studies reflect a widely held notion that short sellers have expectations of weak accounting fundamentals, and in our examination of the determinants of the market response to short spikes we formally consider this effect. Because earnings is the most important accounting fundamental associated with expectations of firm performance and returns, the level of firms' earnings should condition how investors view a new short position. Specifically, we expect the relation between prior earnings (e.g., earnings before the short position is taken) and investors' response to short spike disclosures to be inversely related, because to the extent short interest provides a signal about future prospects, the disclosure would challenge the firm's ability to sustain those earnings. We test the following hypothesis (stated in alternative form):

H2: The market response to spikes in short interest is more negative for firms with higher prior earnings.

III. RESEARCH DESIGN

Sample

Our sample is based on a comprehensive short interest database provided by the New York Stock Exchange (NYSE). The database includes monthly short interest levels on all NYSE common stocks for the 144 months beginning January 1988 and ending December 1999. NYSE members compile the data and report to the exchange by the 15th of each month; the NYSE subsequently discloses the short interest to the public within a week thereafter. Our objective in this paper is to examine the informativeness of these short-selling disclosures. For many firms, however, high levels of short interest or volatility in the level of short interest are not uncommon. The assumption that the disclosure of levels or changes in short interest is unexpected and, therefore, would be informative for all firms, is problematic. We use an approach that identifies a sample of abnormally large changes in short interest, to increase statistical power through examination of what is likely viewed by investors as a new and unexpected information-based short position for a sample firm (i.e., a "short spike"). In our estimation of short spikes we control for both the historical firm-specific level of short interest changes and contemporaneous market-wide movements in short selling, to allow firms to have short interest changes that are high relative to their peers but otherwise normal for that firm. To the extent that changes in firms' short interest are systematically influenced by either of these factors the power of our empirical tests would otherwise be weakened.[8]

To estimate a short spike we use a standard market model approach based on firms' observable changes in short interest. Specifically, for each firm we compute the time series of short interest (*SI*) as the number of shares shorted in month *t* divided by the number of common shares outstanding. We then difference this series to calculate the change in short interest for firm *i* in month *t* (ΔSI), and regress this change against the contemporaneous average monthly short interest change for NYSE common stocks in month *t*. The residuals from these models serve as our proxies for abnormal changes in short interest (ΔASI). The models we estimate by firm are:

$$\Delta SI_{it} = \gamma_0 + \gamma_1 \Delta SI_{mt} + \varepsilon_{it} \tag{1}$$

where:

$$\varepsilon_{it} = \Delta ASI_{it}. \tag{2}$$

We standardize the abnormal short interest change in month *t* (defined as $\Delta SASI$) by dividing ΔASI by its variance.[9] Finally, to be sure the sample contains only discrete jumps in short interest rather than mere continuations of prior increases we identify all firm-month observations meeting two additional criteria: (1) $\Delta SASI$ exceeds 2.0 in month *t* but is less than 1.2 in month $t-1$ (i.e., the initial spike); and (2) within the prior 12 months the short spike is not preceded by another that had not yet reverted back to its pre-spike short interest level.[10] For this second criterion we define a spike in month *t* as having reverted if the cumulative decline in short interest since the short spike is at least 75 percent of the initial increase in short interest during the short spike month.

We impose a number of other restrictions to reach a final sample. First, to ensure a more homogeneous sample for our analyses, we exclude from the database any observation (1) not included on both the CRSP and Compustat databases, (2) for a firm not domiciled in the U.S., and (3) with a book-to-market ratio for given fiscal year in the top or bottom 1 percent of the population distribution of book-to-market ratios. Foreign-based firms are excluded to avoid confounds associated with potential economic or geographic hedges employed by short sellers, for which we cannot control. Excluding firms with extreme book-to-market ratios potentially removes observations with little or no *ex ante* expected relation between price and accounting fundamentals, a primary focus of our tests.[11] Second, all observations occurring either in calendar 1988 or calendar 1999 are excluded, yielding 2,060 firms and 3,572 short spikes. The year 1988 is excluded because the lack of 1987 data makes it impossible to identify whether the 1988 spike is a continuation of 1987 trading decisions. Observations from calendar 1999 are deleted since lack of data for the year 2000 makes it impossible to identify the final outcome for many 1999 short spikes. Third, we exclude 97 firms with less than 20 monthly short interest observations (out of the 144 possible) and 165 short spikes occurring in the month of a stock split. Finally, to eliminate unnecessary complexities involving accounting differences across certain industries, we exclude 379 financial services firms (SIC codes 60–67) and 193 regulated firms (SIC codes 48–49). After these restrictions our primary sample consists of 2,304 short interest spikes associated with 1,333 firms. The effect of each sampling criteria is summarized in Table 1.

---

[8] As an example, CompUSA carries an average short interest of 14.83 percent of common shares outstanding over all available years spanning 1993–1998. During these six years, monthly changes in short interest range from −6.90 percent to 5.97 percent. Given this underlying volatility, we view the absolute changes in short interest for this firm, although substantial, likely to be expected by the market. Because Equations (1) and (2) below consider this underlying volatility, this firm does not enter our sample.

[9] The mean of the firm-specific estimated intercepts for Equation (1) are zero, and 59 percent of the intercept estimates are positive. The mean (median) of the estimated slope coefficients is .68 (.35), and 68 percent of the estimates are positive. The average explanatory power of the model is limited, with a mean (median) adjusted R^2 of .02 (.008), although the firm-specific adjusted R^2 values are above .03 in the upper quartile of the distribution, suggesting that market-wide changes in the level of short interest are associated with at least some firms' short interest changes.

[10] To assess the sensitivity of our results to this definition of a short spike, we evaluated several alternate schemes based on the magnitude of the change in short interest during a single month preceded by 12 months of low or no short interest changes. We used increments of .5 percent of outstanding shares shorted, starting at 1.5 percent and continuing to 4 percent. In each case, we computed the overlap as the percentage of the alternate sample that was also included in the sample we use in our primary tests. The overlaps ranged from 74 percent to 92 percent, suggesting that our designation of a short spike includes most short interest events identified by the alternate sample selection rules. In nearly all cases that did not overlap, a high residual variance from Equation (1) was the cause.

Table 2 summarizes various aspects of the frequency of short spikes. Panel A shows that over half of the sample firms have only one short spike and only 251 firms have more

TABLE 1
Sample Selection Criteria for Short Interest Spike Events during the Years 1989 through 1998

	# Firms	# Positive Spike Events
Short Interest Spikes for US NYSE Common Stocks (1/1/89–12/31/98)	2,060	3,572
Less:		
Firms without at least 20 Observations	(97)	(109)
	1,963	3,463
Spikes in Split Month	(58)	(165)
	1,905	3,298
Financial Firms	(379)	(613)
	1,526	2,685
Regulated Firms	(193)	(381)
Primary Sample of Positive Spike Events	1,333	2,304
Less: Firms without sufficient Compustat and CRSP data	(331)	(627)
Final Sample for Stock Price Tests	1,002	1,677

Table presents the number of firms and number of positive short spikes during the years 1989 through 1998. The sample excludes firm-year observations in the top and bottom 1 percent of the CRSP/Compustat/NYSE population distribution of book/market ratios. Financial institutions, insurance companies, and real estate trusts, comprising SIC codes 60–64 and 67, were eliminated from the sample. Regulated telecommunications firms and utilities were also eliminated from the sample (SIC codes 48 and 49).

---

[11] That is, we exclude from the population of all CRSP/Compustat/NYSE firm-year observations from 1989 through 1998 the top and bottom 1 percent of book-to-market ratios, which includes those firms with the most negative book values and those firms with the largest book value in excess of market value. Relative to the 2 percent of the population that we excluded, 18 short spikes (or .5 of 1 percent of the sample) were also excluded by this outlier rule. The 18 sample observations are quite diverse, including firms with negative book values as well as firms with high book value relative to market value, low analyst following as well as high analyst following, and large positive as well as large negative $AR_{0,+5}$.

TABLE 2
Frequency Characteristics of Short Spike Observations

Panel A: Frequency of Firms by Positive Short Spike

Number of Positive Spikes	Number of Firms	Number of Spikes
1	720	720
2	362	724
3	159	477
4	79	316
5	11	55
6	2	12
Total	1,333	2,304

Panel B: Frequency of Positive Short Interest Spikes by Calendar Year and Month

By Calendar Month		By Calendar Year	
January	154 (7%)	1989	144 (6%)
February	202 (9%)	1990	106 (5%)
March	177 (8%)	1991	116 (5%)
April	221 (10%)	1992	159 (7%)
May	180 (8%)	1993	199 (9%)
June	169 (7%)	1994	205 (9%)
July	227 (10%)	1995	249 (11%)
August	199 (9%)	1996	300 (13%)
September	173 (7.5%)	1997	402 (17%)
October	196 (8.5%)	1998	424 (18%)
November	216 (9%)		
December	190 (8%)		
Total	2,304 (100%)		2,304 (100%)

Panel C: Monthly Levels and Changes of Percent of Outstanding Shares Shorted

Month	n	Mean	Min	25%	Median	75%	Max
Monthly Levels of Percent of Outstanding Shares Shorted							
−2	2,293	1.24	0.0	0.17	0.55	1.37	30.83
−1	2,299	1.32	0.0	0.18	0.57	1.48	37.52
0	2,304	2.95	0.0	0.81	1.60	3.59	65.57
+1	2,293	2.84	0.0	0.57	1.39	3.51	48.59
+2	2,281	2.73	0.0	0.48	1.27	3.39	41.68
+3	2,261	2.58	0.0	0.41	1.16	3.12	40.28
+6	2,218	2.30	0.0	0.32	0.98	2.60	45.11
+12	2,136	2.11	0.0	0.28	0.91	2.28	47.10
Monthly Changes in Percent of Outstanding Shares Shorted							
−2 to −1	2,294	.07	−6.36	−.07	.01	.18	6.69
−1 to 0	2,304	1.63	.001	.49	.93	1.87	28.05
0 to +1	2,293	−.12	−40.23	−.39	−.06	.23	16.63
+1 to +2	2,281	−.11	−23.52	−.29	−.03	.16	6.25
+2 to +3	2,261	−.14	−16.05	−.25	−.02	.15	11.16

Table presents the frequency of short spikes by firm, the frequency of short spikes by month and by calendar year, and the relative size of the short positions across the full sample of 2,304 available short spikes.

than two short spike events. Panel B shows the incidence of short spikes by calendar month and year, and indicates no obvious clustering by month although the frequency is somewhat lower in January, perhaps because of tax-related short selling (Brent et al. 1990). Consistent with hedge fund growth and the bull market of the late 1990s, we find a sharp increase in the frequency of short spikes beginning in 1995: 249 (11 percent) enter the sample in 1995, and this frequency increases to a high of 424 (18 percent) short spikes in 1998.

Panel C of Table 2 reports summary statistics on the distribution of the percentage of outstanding shares shorted with observations aligned in event time (month 0 equals short spike month). Summary statistics are shown from months −2 through +3 as well as at 6 and 12 month lags after the short spike.[12] These results indicate that even though all observations meet the criteria for classification as short spikes, many of the short positions represent only a small percentage of total shares outstanding. The mean and median percentage of outstanding shares shorted is 2.95 and 1.60 percent, respectively, for the short spike month (i.e., month 0), and is comparable to levels documented in prior research (e.g., Richardson 2003; Dechow et al. 2001). Finally, there is considerable cross-sectional variation in the level of short interest. For month 0, the minimum percentage of outstanding shares shorted is .0006 percent (the minimum is zero in all other months) and the maximum is 65.57 percent.

Panel C of Table 2 also reports summary statistics on changes in short interest for months −1 through +3. Not surprisingly these data are consistent with those on short interest levels, but they highlight two additional aspects of our sample. First, changes in month −1 are more likely to be increases in short interest than decreases despite truncating large positive month −1 short interest changes in selecting the sample. Second, the changes in months +1 through +3 are negative at both the mean and median, suggesting that short interest is likely to decline following a short spike.

Table 3 summarizes comparisons of (annual) earnings-to-price, book-to-market, return-on-equity, earnings growth, total assets, and financial leverage. The statistics are provided for the sample firms at the fiscal year end prior to the short spike (top row of each variable) and at the subsequent fiscal year end (bottom row), with comparable statistics also provided for the population of 1989 through 1998 NYSE firm-years. Future earnings declines appear to be related to the decision to short a stock. At each quartile the three earnings based fundamentals deteriorate, with the drop in earnings-to-price (at the mean and median) and in EPS growth (at the median) statistically significant. The comparisons between the sample and the population are more striking and uniformly significant. For instance, the comparisons reveal that the shorted firms are smaller (i.e., less assets) and have lower leverage. The firms that experienced short spikes had higher earnings-to-price ratios prior to the short spike but lower earnings-to-price subsequent to the short spike, and book-to-price ratios that were lower than the population of firm-years both before and after the short spike. In sum, short sellers appear to be targeting firms not representative of the full population of NYSE firms.

Stock Price Response to Short Spike Announcements

We gather the short interest disclosure dates as reported in the *Dow Jones Newswire* and define this as the (day 0) announcement date. To assess how stock prices respond to these announcements, in our primary tests we use a model in which abnormal stock returns

---

[12] The sample size declines from 2,304 in month 0 to 2,136 in month +12 because of mergers or takeovers, liquidations, and delistings that occur within 12 months following the short spike date.

TABLE 3
Characteristics of Firms before and after the Short Spike Disclosure and Relative to the Full Population of NYSE Firms

	Sample					NYSE Population		
Characteristic	**n**	**Mean**		**Median**		**n**	**Mean**	**Median**
Earnings/Price	2,047	0.01	*#	0.06	*#	18,655	0.00	0.06
	2,215	−0.03	#	0.05	#			
Book/Market	2,047	0.55	#	0.47	#	18,650	0.63	0.57
	2,213	0.54	#	0.47	#			
Return on Equity	2,047	2.68	#	12.27	#	18,638	9.21	11.52
	2,212	8.23		11.67				
EPS Growth (percent)	2,041	15.56		16.23	*#	18.494	391.51	11.11
	2,206	−7.25		10.81	#			
Assets (millions)	2,047	3,030.0	#	682.9	#	18,655	6,726.6	1,026.8
	2,215	3,066.4	#	714.7	#			
Financial Leverage	2,046	0.58	#	0.57	#	18,607	0.65	0.62
	2,210	0.59	#	0.58	#			

---

* Indicates that the mean (median) prior value of the variable is significantly different than the subsequent value of the variable at less than or equal to .10.

# Indicates that the sample value of the variable is significantly different than the population value of the variable at less than or equal to .10.

Mean comparisons are from t-tests on the difference in means assuming unequal variances. Median comparisons are from Wilcoxon tests. The significance of all comparisons is assessed with two-tailed tests.

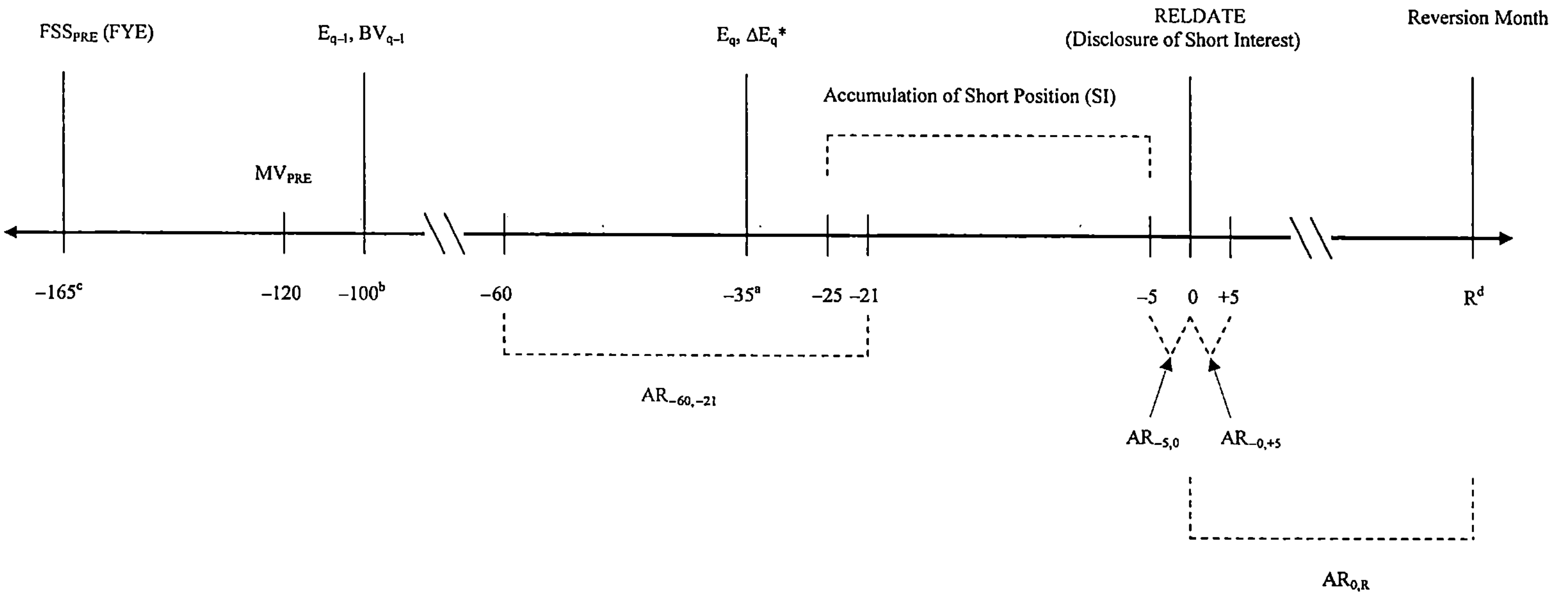
Table presents comparisons between sample (prior and subsequent to the short spike) and population observations on select firm characteristics. Earnings/Price and Book/Market ratios are annual income before extraordinary items and book value of common equity, respectively, each divided by market value three months after the fiscal year end. Return on Equity is annual income before extraordinary items and discontinued operations available for common divided by common equity, times 100. EPS Growth is net income for year t less net income for year $t-1$, both before extraordinary items, divided by the absolute value of net income before extraordinary items in year $t-1$. Assets is total assets in millions of dollars, and financial leverage is total liabilities divided by total assets.

are regressed on proxies for analyst coverage, accounting fundamentals, price run-ups prior to the short spike, and the costs and risks associated with short selling. Buy and hold market-adjusted returns ($AR_{0,+5}$), measured from the announcement date through the subsequent five trading days, is the dependent variable. Figure 1 summarizes the timing of this measurement relative to the other independent regressors. The figure shows the timing of the fiscal period end for measurement of the accounting variables, but it should be noted that the disclosure of these measurements occurred up to 45 days after the fiscal period end. With these variables we measure accounting values that were publicly available information at the time of the short spike, except possibly a small number of earnings changes that may not have been announced by the time of the short spike announcement.

The primary regression model is (firm subscripts omitted):

$$\begin{aligned} AR_{0,+5} = {} & \delta_0 + \delta_1 ANFOL_0 + \delta_2 E_{q-1} + \delta_3 \Delta E_q + \delta_4 E_{q-1} \times ANFOL_0 \\ & + \delta_5 \Delta E_q \times ANFOL_0 + \delta_6 BV_{q-1} + \delta_7 FSS_{PRE} + \delta_8 AR_{-60,-21} \\ & + \delta_9 MV_{PRE} + \delta_{10} SI_0 + v. \end{aligned} \tag{3}$$

FIGURE 1
Timeline of Key Variable Measurement for a Representative Short Interest Observation



---

* Earnings (E) are quarterly and scaled by price measured on day −21. The quarterly change in earnings is seasonally adjusted.

[a] Representative date: Quarter ending between trading day −75 and −11, measurement disclosed within 45 days.

[b] Representative date: Quarter ending between trading day −140 and −76, measurement disclosed within 45 days.

[c] Representative date: Fiscal year end ending between one and thirteen months before RELDATE.

[d] Reversion date (R) of short position. Estimated as reverting on midpoint of the month if short interest has declined to its pre-spike levels, plus 25 percent of the initial short spike.

ANFOL is a dummy variable equal to 1 if analyst coverage for a firm is low, and 0 otherwise. We hypothesize a more negative price response for firms with low analyst following so we expect δ_1 to be negative. *ANFOL* is binary given our expectation that the price response to short selling is dependent on whether analyst coverage exists, not its level. To define our measure of "low" analyst coverage we select a threshold of one analyst or less given that few firms in our sample have zero analyst coverage.[13]

Earnings and earnings changes are included in Equation (3) to capture short seller expectations of overstated earnings that, when revealed to the market, lead to stock price declines. Each variable is scaled by price per share measured one month before the announcement (trading day −21). We measure earnings per share before extraordinary items (E_{q-1}) for the quarter before the month of the short spike (i.e., between 76 and 140 trading days prior to the announcement). Earnings change (ΔE_q) captures the *ex post* sustainability of those earnings, and is measured as the seasonally adjusted difference between E_q and earnings four quarters prior.[14] Because we expect higher quarter $q-1$ earnings to be associated with more negative abnormal returns, we expect the coefficients δ_2 and δ_3 to be negative and positive, respectively. We hypothesize that the relation between abnormal stock returns and earnings is related to the firm's information environment. Thus, the interaction of earnings and earnings changes with analyst following (*ANFOL*) is included in the model. Because *ANFOL* is equal to 1 for firms with low analyst following, the coefficients δ_4 and δ_5 represent the different effects earnings and earnings changes have on abnormal returns between low and high analyst coverage firms. If this effect is larger for firms with high analyst following, then we expect $\delta_4 > 0$ and $\delta_5 < 0$.

Staley (1997), among others, asserts that short sellers target firms with deteriorating fundamentals, and further that these fundamentals are observable in publicly available financial reports. Book value per common share scaled by price (*BV*) and Lev and Thiagarajan's (1993) fundamental signal score (*FSS*) are proxies for accounting fundamentals. Each has been shown to be a predictor of future returns and earnings. Prior research has documented that future returns are associated with book-to-price (Fama and French 1992; Lakonishok et al. 1994; Piotroski 2000), particularly that high book-to-price firms outperform low book-to-price firms. To the extent that short sellers are perceived to be trading on this anomaly, a positive relation would exist. We include *FSS* as another control for weak accounting fundamentals. Lev and Thiagarajan (1993) identify 12 accounting fundamentals that they aggregate into a single statistic, and find the measure significantly predicts future earnings.[15] We apply the same approach. *FSS* ranges from 0 to 1, with lower values implying stronger firm fundamentals. We therefore expect δ_7 to be negative.

Prior run-up in stock price is a proxy for expectations of short-term overvaluation (i.e., price bubbles), a firm characteristic frequently targeted by short sellers (Staley 1997). $AR_{-60,-21}$ is our proxy for a prior run-up in stock price, measured as the buy and hold market-adjusted return from 60 to 21 days before the announcement date. We expect this variable to have a negative coefficient.

---

[13] We evaluate the sensitivity of this choice to alternative levels of analyst coverage in the measurement of *ANFOL*, as discussed below.

[14] Our inferences are the same but a bit weaker when we use the quarter-to-quarter change in earnings (e.g., $E_q - E_{q-1}$).

[15] The 12 components of *FSS* are changes in inventory, accounts receivable, capital expenditures, research and development, gross margin, selling and administrative expenses, labor force, and the provision for doubtful accounts, the company's effective tax expense over share price, the order backlog, whether the firm uses LIFO, and whether there is a current audit qualification. Including these components individually had no impact on our inferences. Abarbanell and Bushee (1997) find that the change in capital expenditures and accounts receivable do not have the predicted negative relation with future earnings. Excluding these two components from our calculation of *FSS* also had no effect on our inferences.

Finally, we expect announcement period abnormal returns to be inversely related to the costs of short selling. We use two proxies for these costs, firm size and short interest relative to shares outstanding, each of which we expect to be negatively related to announcement period returns because higher short-selling costs imply a stronger short selling signal. Firm size, *MV*, is the natural log of the firm's market value (in millions) 120 trading days prior to the announcement date. We control for firm size because selling short a larger firm is more likely to be a hedge against underlying industry or location-specific risks and, therefore, less likely to be an information-based short sale. Conversely, shares in smaller firms are more difficult to borrow (i.e., less liquid) and since short sellers are willing to bear this risk, the short position is more likely to be information-based. The number of shares shorted as a percentage of shares outstanding on the announcement date, *SI*, is a proxy for the size of the resulting short position and the risk of a short squeeze, and therefore we expect higher *SI* to be associated with more negative abnormal returns.

IV. RESULTS

Univariate Characteristics of Key Variables

Table 4 summarizes the distributions of each regression variable and other relevant variables. Across the full sample in Panel A, we find that the average abnormal returns on the announcement date and the five trading days thereafter, $AR_{0,+5}$, is negative but very small (mean = −0.105 percent; median = −0.185 percent). The untabulated mean of the day 0 abnormal returns is also indistinguishable from zero. However, the announcement period abnormal return exhibits substantial cross-sectional variability with an interquartile range of approximately 5.3 percent (2.1 percent) for the six- (one-) day return intervals. This limited market response to the announcement does not appear to be due to an early response, as $AR_{-5,0}$ in Panel A is similarly negative but insignificant. The aggregate abnormal returns we document are consistent with earlier research that uses levels or changes in short interest (e.g., Senchack and Starks 1993).

Panel A of Table 4 shows that short spikes are associated with relatively low earnings, seasonally adjusted earnings changes, and book values (all relative to price) around the time of the reported short spikes. The abnormal return from day −60 to day −21, our proxy for run-ups in stock price reflecting price bubbles, is negative (median = −1.314 percent) and varies considerably across the sample, ranging from a 10 percent decline in price at the first quartile to a 7 percent increase at the third quartile. Consistent with Panel C of Table 2 the mean (median) percentage of outstanding shares sold short is 2.9 (1.6) percent.

Panel B of Table 4 presents the mean and median for each regression variable partitioned by low and high analyst following. Not surprisingly, we find that firms with low analyst coverage are significantly smaller, as the mean market value is $184.5 million compared with over $3.5 billion for firms with high analyst following. The mean and median abnormal return around the short interest announcement, however, is significantly lower for low coverage firms (mean of −1.5 percent versus 0.1 percent, t-statistic for difference = 3.13). This comparison provides some preliminary evidence that short-selling disclosures are informative, with the market response dependent on analyst following as predicted under H1. Both earnings-based variables indicate no difference across the two subsamples, although firms in the low-coverage group are on average not profitable (mean = −0.005). The mean level of short interest is significantly higher for high-coverage firms

(3.0 versus 2.2 percent, t = 3.71) despite the more negative reaction to short sale announcements by low-coverage firms. As a whole, Panel B shows that there are marked differences in the price response, fundamentals, and short-selling characteristics based on our classification of firms as low or high analyst coverage.

TABLE 4
Distributions of Selected Firm Characteristics

Panel A: Distributions for Variables across the Full Sample

Variables	n	Mean	Std. Dev.	Quartile 1	Median	Quartile 3
$AR_{0,+5}$	1,677	−0.105	6.024	−2.782	−0.185	2.523
$AR_{-5,0}$	1,677	−0.199	5.956	−2.878	−0.229	2.523
$NUMEST$	1,677	9.948	8.450	3.000	8.000	15.000
E_{q-1}	1,677	.003	.142	.008	.014	0.020
ΔE_q	1,677	.002	.136	−.007	.001	.006
BV_{q-1}	1,677	.540	.541	.287	.449	.681
FSS	1,677	.458	.143	.364	.455	.556
$AR_{-60,-21}$	1,677	−0.233	16.968	−9.749	−1.314	6.856
MV	1,677	3,051.7	11,091.6	225.6	686.6	2,085.8
SI	1,677	.029	.038	.009	.016	.033

Panel B: Distributions for Variables by Low and High Analyst Following

	Low Following		High Following		
Variables	n	Mean (Median)	n	Mean (Median)	Low = High t-statistic
$AR_{0,+5}$	236	−1.447 (−0.846)	1,441	0.115 (−0.001)	3.13***
E_{q-1}	236	−.005 (.011)	1,441	.005 (.001)	1.08
ΔE_q	236	.009 (.003)	1,441	.001 (.001)	−0.46
BV_{q-1}	236	.722 (.620)	1,441	.511 (.427)	−3.86***
FSS	236	.450 (.449)	1,441	.460 (.455)	0.93
$AR_{-60,-21}$	236	4.341 (−.002)	1,441	−0.983 (−1.672)	−3.86***
MV	236	184.5 (90.8)	1,441	3,521.3 (941.2)	10.62***
SI	236	.022 (.008)	1,441	.030 (.017)	3.71***

*** Denotes significance at the 0.01 levels, based on two-tailed tests.

Table presents the distributions of select variables, including all regression variables, for the final sample of 1,677 short spike firms with necessary Compustat and CRSP data. In Panel B, the sample is split between firms with low analyst coverage (number of analysts following firm <= 1) and high analyst coverage (number of analysts following firm > 1).

(*continued on next page*)

TABLE 4 (continued)

Variable definitions:

$RELDATE$ = the short interest announcement date;

$AR_{0,+5}$ = buy and hold market-adjusted return from trading day 0 to trading day +5 relative to $RELDATE$;

$AR_{-5,0}$ = buy and hold market-adjusted return from day −5 to day 0;

$NUMEST$ = number of analyst forecasts outstanding in the last month of the fiscal year end prior to short spike;

E_{q-1} = earnings per share before extraordinary items for the quarter $q-1$ (ending between 106 and 195 calendar days prior to $RELDATE$), scaled by price per share as of trading day −21 relative to $RELDATE$;

ΔE_q = seasonally adjusted change in earnings per share between quarter $t = -4$ and quarter $= 0$ divided by price at day −21;

BV_{q-1} = book value per share at the end of quarters $t = -1$, scaled by price at day −21;

$AR_{-60,-21}$ = buy and hold market-adjusted return from 21 to 60 days before $RELDATE$;

MV_{PRE} = natural log of the market value of the sample firm (in millions of dollars) on the earliest trading day in the interval beginning 120 trading days prior to $RELDATE$ and ending the day before $RELDATE$;

SI = number of shares sold short divided by total number of common shares outstanding on $RELDATE$; and

FSS_{PRE} = Fundamental Signal Score computed as in Lev and Thiagarajan (1993) as of the last fiscal year end at least one month but no more than 13 months prior to $RELDATE$.

Primary Regression Results

Summary regression statistics from our primary model are presented in Table 5. For comparative purposes the first column of coefficient estimates are for a restricted form of Equation (3) that excludes consideration of the level of analyst following. Also for comparative purposes, because any partition based on low or high analyst following is necessarily *ad hoc*, we consider various levels for *ANFOL* ranging from no coverage to at most four analysts following the firm. The remaining four columns provide coefficient estimates based on these graduated levels. The discussion below focuses on the partition at analyst following of less than or equal to 1.

Results from the restricted version of Equation (3) reveal an inverse relation between abnormal returns around short spike announcements and earnings. When we partition the sample into low and high analyst coverage groups, however, Table 5 shows a significant difference in market response between the two groups, consistent with Panel B of Table 4 and as expected under H1. The mean abnormal return is significantly more negative for firms with low analyst following ($\delta_1 = -0.0172$). While the abnormal return remains significantly negatively associated with earnings levels for the full sample ($\delta_2 = -0.1539$), we find the interaction of earnings and analyst following to be significantly positive ($\delta_4 = 0.1549$), indicating the negative relation between abnormal returns and earnings expected under H2 is strongest for firms with high analyst coverage. These relations between analyst following and the intercept and earnings slope coefficients generally hold when one or no analysts follow the firm, but they subside when two or more analysts follow the firm. Among the control variables, only stock price run-ups prior to the short spike are consistently (and negatively) related to announcement period returns. The coefficients on the two variables included to capture firm fundamentals, *BV* and *FSS*, are insignificant, as are the coefficients on the proxies for the costs of short selling, *MV* and *SI*.

The significant negative coefficient on earnings from Equation (3) is interpretable as investors viewing the short spike as providing a signal about the sustainability of firms' earnings. Conditional on the short spike, higher earnings levels are priced as less likely to persist. One factor that may further explain this relation is a separate examination of the accrual and cash flow components that comprise reported earnings. By definition accruals

TABLE 5
Regression of Short Spike Announcement Period Abnormal Returns on Fundamentals, Proxies for Price Bubbles, and the Expected Costs of Short Selling
Regression Models Estimated using Various Levels of Low and High Analyst Coverage

$$AR_{0,+5} = \delta_0 + \delta_1 ANFOL_0 + \delta_2 E_{q-1} + \delta_3 \Delta E_q + \delta_4 E_{q-1} \times ANFOL_0 + \delta_5 \Delta E_q \times ANFOL_0 + \delta_6 BV_{q-1} + \delta_7 FSS_{PRE} + \delta_8 AR_{-60,-21} + \delta_9 MV_{PRE} + \delta_{10} SI_0 + \nu$$

Variable	**Predicted**	**Restricted Model**	***ANFOL* = 1 When Coverage = 0**	***ANFOL* = 1 When Coverage <= 1**	***ANFOL* = 1 When Coverage <= 2**	***ANFOL* = 1 When Coverage <= 4**
Intercept	–	−0.0051	0.0075	0.0114	0.0074	0.0016
ANFOL	–		−0.0175***	−0.0172***	−0.0095**	−0.0035
E_{q-1}	–	−0.1352***	−0.1524***	−0.1539***	−0.0532*	−0.0540*
ΔE_q	+	−0.0010	0.0254*	0.0252	0.0562*	0.0475*
$E_{q-1} \times ANFOL$	+		0.1558***	0.1549***	−0.0927	−0.0892
$\Delta E_q \times ANFOL$	–		−0.0426**	−0.0436**	−0.0758**	−0.0660**
BV_{q-1}	+	−0.0029	−0.0038	−0.0034	−0.0040	−0.0039
FSS	–	0.0038	0.0028	0.0024	0.0054	0.0060
$AR_{-60,-21}$	–	−0.0272***	−0.0263***	−0.0232***	−0.0252***	−0.0263***
MV	–	0.0008	−0.0007	−0.0011	−0.0008	−0.0002
SI	–	−0.0256	−0.0413	−0.0485	−0.0441	−0.0370
Adjusted R^2		.101	.120	.123	.110	0.106
n		1,677	1,677	1,677	1,677	1,677

***, **, * Denote significance at the 0.01, 0.05, and 0.10 levels, respectively, based on two-tailed tests.
ANFOL = dummy variable taking the value of 1 when analyst following is low, and 0 otherwise.
All other variables are as defined in Table 4.

represent the difference between earnings and cash from operations, and firms with high accruals have been shown to exhibit declines in future earnings and returns (Sloan 1996). Both the considerable discretion management has to inflate accruals (relative to cash from operations) and their reversing nature drive this decline.

Table 6 reports our re-estimation of a variant of Equation (3), allowing the coefficient on earnings to vary based on its accrual and cash from operations components. We re-estimate the model separately for the subsamples of firms with low and high analyst coverage, and find no evidence that accruals, as a proxy for earnings quality, is driving the association of earnings with announcement period returns. Consistent with Table 5, we find earnings is significantly associated with the announcement period abnormal return for the subsample with more than one analyst following the firm (coefficient = −0.1495, significant at .01). We are able to document no such relation for the low coverage firms. When earnings is partitioned there is no distinguishable difference in the response across cash flows and accruals. The coefficients on accruals (−0.1496) and cash from operations (−0.1479) are both significant and statistically equivalent (F-statistic = 0.06).

Sensitivity Checks

The results documented above are robust to several sensitivity checks. We re-estimated Equation (3) controlling for outliers by winsorizing each variable at the top and bottom 1 percent. In a separate procedure we also excluded influential observations as identified by Belsley et al. (1980) procedures. Untabulated results from these approaches support the same inferences as those reported.

In Table 7 we re-estimate Equation (3) focusing on observations for which short interest is greater than 1.0 and 2.0 percent of firms' outstanding shares. We perform this check because high levels of short interest are arguably the observations for which the risk of a short squeeze is highest. In addition, low-analyst-following firms have average lower levels of short interest (see Panel B of Table 2) and this characteristic may be unduly influencing the inferred relation between earnings and returns. Although we control for the level of short interest with the inclusion of *SI* in Equation (3), we nevertheless expect that very high short interest positions are more likely to be information-based, and thus our model might better explain abnormal returns for firms with the highest outstanding short positions.[16] Our inferences are unchanged. The adjusted R^2 increases as we restrict the sample to larger levels of short interest (.227 for the subsample of at least 2.0 percent short interest), but earnings remains strongly associated with abnormal returns for the firms with high analyst following and significantly different for firms with low following (F-statistics of 7.29 and 4.36 for the 1.0 and 2.0 percent short interest thresholds, respectively).

We also evaluate Equation (3) under two final partitions of our full sample (not tabulated) with unique characteristics that *ex ante* should yield more powerful tests: (1) short spikes during the years 1989–1993, and (2) short spikes in securities that were not optionable. We examine observations from the first half of the sample because our data indicates increases in short interest over the time period. We speculate that a substantial part of this increase comes from the risk management activities of hedge funds adopting short positions to hedge industry- and period-specific risk associated with long positions or derivatives.[17] Therefore, we expect short spikes from 1989–1993 to be associated with a higher probability of being information-based short selling, and thus that our model would better explain

---

[16] These observations are also interesting because they are similar to the substantial short positions studied by Dechow et al. (2001).

[17] This speculation has been confirmed by a hedge fund manager, who wishes to remain anonymous.

TABLE 6

Regressions of Short Spike Announcement Period Abnormal Returns on Earnings and Earnings Partitioned into Cash Flows and Total Accruals, plus Controls for Price Bubbles and the Expected Costs of Short Selling Estimated on Subsamples of Firms with Low and High Analyst Coverage

Model (1):

$$AR_{0,+5} = \alpha_0 + \alpha_1 E_{q-1} + \beta_1 \Delta E_q + \beta_2 BV_{q-1} + \beta_3 FSS + \beta_4 AR_{-60,-21} + \beta_5 MV + \beta_6 SI_0 + v$$

Model (2):

$$AR_{0,+5} = \alpha_0 + \gamma_1 CFO_{q-1} + \gamma_2 TAC_{q-1} + \beta_1 \Delta E_q + \beta_2 BV_{q-1} + \beta_3 FSS + \beta_4 AR_{-60,-21} + \beta_5 MV + \beta_6 SI_0 + v$$

		Low Following		High Following	
Variable	**Predicted**	**Model (1)**	**Model (2)**	**Model (1)**	**Model (2)**
Intercept	–	−0.0278	−0.0252	0.0159	0.0159
E_{q-1}	–	−0.0194		−0.1495***	
CFO_{q-1}	–		−0.0004		−0.1479***
TAC_{q-1}	–		0.0098		−0.1496***
ΔE_q	+	−0.0243	−0.0266	0.0217*	0.0204
BV_{q-1}	+	−0.0078	−0.0071	−0.0013	−0.0015
FSS	–	0.0422	0.0412	−0.0078	−0.0078
$AR_{-60,-21}$	–	−0.0477**	−0.0493***	−0.0215***	−0.0215***
MV	–	0.0009	0.0004	−0.0012	−0.0012
SI	–	−0.1048	−0.0879	−0.0485*	−0.0481
F-statistic:					
$CFO >$ Accruals	+		0.42		0.06
Adjusted R^2		.01	.01	.15	.15
n		214	214	1,355	1,355

***, **, * Denote significance at the 0.01, 0.05, and 0.10 levels, respectively, based on one-tailed tests.
CFO is cash flow from operations and *TAC* is total accruals. The latter is computed as E_{q-1} less CFO_{q-1}.
All other variables are as defined in Table 4.

abnormal announcement period returns in the earlier half of the period.[18] For the 524 short spikes that occur during this time period we find this to be the case. The model has markedly more explanatory power (adjusted R^2 of .314 versus .123). In addition, using only observations from the first half of the period yields a marginal association of book values with abnormal returns ($\delta_6 = -0.0106$, significant at .05). The significant differences across low and high analyst partitions for abnormal returns and the relation of abnormal returns with earnings remain strong as in the estimation with the full sample.

Finally, we expect short spikes associated with optionable stocks are more likely to be hedges against derivatives positions. Senchack and Starks (1993) find that whether a stock is optionable is significantly related to abnormal returns around the time of short interest announcements. Short selling non-optionable stocks is more likely to be information-based,

---

[18] In addition, the earlier half of the period corresponds to the time period studied in most prior literature (e.g., Senchack and Starks 1993; Asquith and Meulbroek 1996; Dechow et al. 2001).

TABLE 7

Selected Regressions of Modified Equation (3) on Subsamples of Large Short Interest Levels

		SI ≥ 1.0%		SI ≥ 2.0%	
Variable	**Predicted**	**Coefficient**	**F-statistic (*HIGH* = *LOW*)**	**Coefficient**	**F-statistic (*HIGH* = *LOW*)**
Intercept	–	0.0019		0.0014	
ANFOL	–	−0.0166***		−0.0289***	
$E_{q-1} \times LOW$	–	−0.0352		0.0187	
$E_{q-1} \times HIGH$	–	−0.1990***	7.29***	−0.1876***	4.36**
$\Delta E_q \times LOW$	+	−0.0234		−0.0275	
$\Delta E_q \times HIGH$	+	0.0526	2.09	0.0542*	1.24
BV_{q-1}	+	−0.0068		−0.0061	
FSS	–	0.0053		0.0196	
$AR_{-60,-21}$	–	−0.0212**		−0.0227**	
MV	–	0.0000		−0.0009	
SI	–	−0.0232		−0.0165	
Adjusted R^2		.166		.227	
n		1,159		703	
n: *ANFOL* = 1		107		66	

***, **, * Denote significance at the 0.01, 0.05, and 0.10 levels, respectively. Coefficient significance levels are based on one-tailed tests in the predicted direction indicated. F-tests are based on two-tailed tests.

The table summarizes a modified version of Equation (3) on the subset observations with short interest levels greater than 1.0 percent and 2.0 percent of shares outstanding.

Equation (3) is modified to allow separate for the direct estimation of earnings and earnings change coefficients for the partitions of low and high analyst following. F-statistics are from an F-test of the restriction that the coefficients on each of these variables for the low and high partitions are equivalent.

All variables are as defined in Table 4.

and we expect it to be associated with larger negative abnormal returns. When we estimate Equation (3) on the 1,157 short spike observations that do not have traded options, the adjusted R^2 is modestly higher at .155, but the coefficient estimates and significance levels are very similar to those of our full regression.

V. SHORT SELLER PROFITABILITY

Our results indicate that investors respond to disclosures of short spikes conditional on factors unique to firms' information environments. Analyst coverage helps describe both the mean abnormal return and how earnings relates to that return. In this section we explore whether these same factors help explain the *ex post* profitability of a short sale, specifically whether short sellers earn higher returns by targeting lightly followed, smaller stocks, as implied by the announcement period stock price response. These tests also document whether *ex post* returns to short selling are predictable based on the same set of characteristics that explain announcement period abnormal returns, and whether the announcement period abnormal return itself is predictive of short sellers' profits. We estimate the following model (firm and period subscripts omitted):

$$
\begin{aligned}
AR_{0,R} = {} & \alpha_0 + \alpha_1 ANFOL + \alpha_2 RMONTH + LOW \times (\Phi^L \Gamma + \phi^L_g AR_{0,+5}) \\
& + \text{HIGH} \times (\Phi^H \Gamma + \phi^H_g AR_{0,+5}) + \varepsilon. \qquad (4)
\end{aligned}
$$

In Equation (4) the dependent variable, $AR_{0,R}$, is the market-adjusted buy-and-hold return from the announcement date through the midpoint of the month in which short interest returns to more normal levels (i.e., the reversion month, R). For each month, a short spike is classified as reverting if the short interest as of that month has declined to its pre-spike levels, plus 25 percent of the initial short spike. *RMONTH* is the number of months before the short position has reverted, and *LOW* (*HIGH*) is a dummy variable equal to 1 if analyst following is less than or equal to 1 (greater than 0), and 0 otherwise. Equation (4) is estimated using the 1,207 observations with complete data for which short interest reverts within one year of the short spike. We partition the independent variables to allow each to vary by analyst coverage. Beyond *RMONTH* and $AR_{0,+5}$, all independent variables are those used in the estimation of Equation (3). The matrix Γ contains the seven independent variables from Equation (3), and Φ^L and Φ^H the seven coefficient estimates from the low and high subsamples, respectively.

First, a review of the profitability of the short positions indicates that short sellers are profitable on average. Table 8 provides a summary of the cumulative return through the reversion month ($AR_{0,R}$) for the full sample and partitions based on the samples of *LOW* and *HIGH* analyst coverage. Test statistics for the difference from zero are based on t-tests using the cross-sectional standard deviation of returns. All observations are grouped by the month of reversion relative to the short spike month. Over half of the short spikes revert within the first four months following the original short spike (54.5 percent for the full sample) with untabulated frequency distributions further revealing that about 20 percent of

TABLE 8
Profitability Statistics of the Short Spike Sample and Relevant Partitions
Cumulative Percentage Returns Earned by Short Sellers over Their Investment Horizon

Reversion Month	1–4	5–8	9–12	>12	Total
Full Sample					
$AR_{(0,R)}$	−1.03**	−2.54*	−7.66***	−15.56***	−4.74***
n	1,183	375	179	434	2,171
% of total	54.5	17.3	8.2	20.0	100.0
LOW Following (<= 1)					
$AR_{(0,R)}$	−3.09**	1.87	−9.11*	−24.87***	−6.79***
n	134	38	21	43	236
% of total	56.8	16.1	8.9	18.2	100.0
HIGH Following (=> 2)					
$AR_{(0,R)}$	−0.40	−0.34	−6.21***	0.69	−0.60
n	706	237	123	375	1,441
% of total	49.0	16.4	8.5	26.0	100.0
t-stat: $\overline{X}_{Low} - \overline{X}_{High}$	−1.75**	0.38	−0.38	−1.70**	−1.58*

The table provides statistics related to mean profitability (percentage returns) of short positions. For each month, a spike is classified as reverting if the short interest as of that month has declined to its pre-spike levels, plus 25 percent of the initial short spike. Mean cumulative returns through reversion month ($AR_{(0,R)}$) are the buy-and-hold returns from the short spike announcement date (day 0) through the midpoint of the reversion month (R), multiplied by 100. The buy-and-hold return for non-reverting spikes (i.e., ">12") is the annual return over the 12 months following the spike month. The first row of statistics is for the full sample with return data available. The next two rows of statistics relate to the subsamples of low and high analyst coverage for which data is available to estimate Equation (4). Low and high analyst coverage is defined at the threshold of one analyst following the firm. The final row reports a t-test for difference in means (with unequal variances) across the low and high coverage subsamples. ***, **, * Denote significance at the 0.01, 0.05, and 0.10 levels, respectively, based on two-tailed tests.

the short spikes revert in the first month. One implication of these reversion rates is that analysis of associations between returns and accounting fundamentals beyond one year would be inappropriate for the majority of our sample.

The significant negative returns for the full sample imply that short sellers purchase and replace borrowed securities at a price lower than that initially received. Aggregating across all spikes we find the mean holding period return is -4.74 percent, significant at .01.[19] This return, however, is driven by spikes with longer holding periods. The mean return for spikes reverting in months 1–4 and months 5–8 are only -1.03 and -2.54 percent, respectively, both of which are significant but small. In contrast, spikes reverting in months 9–12 and nonreverting spikes are characterized by much larger negative returns of -7.66 and -15.56 percent, significant at .01. The higher profitability of the average short position as the duration of the position increases is not surprising given it is reasonable to assume that the risk of a short squeeze increases as the duration of the open short position increases.

The Table 8 partitions by subsamples of low and high coverage indicate the same general reversion patterns and profitability characteristics as for the full sample. For each subsample about one-half of the short spikes revert within four months, and cumulative holding period returns tend to be lower (i.e., more profitable) as the holding period extends beyond eight months. Short seller profitability varies marginally across the two groups, with the mean holding period return significantly lower for the *LOW* analyst coverage subsample (-6.79 percent; significantly different from high coverage firms at .10).

Estimation results for Equation (4) are summarized in Table 9. In contrast to the moderate differences in holding period returns across the low and high analyst coverage subsamples, the coefficient on *ANFOL* that captures this difference in a multivariate context is insignificant ($\alpha_1 = -0.0447$). As with our primary regressions explaining announcement period returns, we find that the coefficient on earnings is more strongly associated with returns for firms with high coverage ($\Phi_1 = -0.2830$, $F = 8.30$). Earnings changes are also related to short seller profitability for the high following subsample (0.4144). The inference from these relations between short seller profitability and earnings levels and changes is that firms with higher earnings prior to the short position are more likely to generate significant profits for short sellers, but if those high earnings are sustained with higher earnings growth in the period immediately prior to the short spike, short sellers are less likely to make profits. In Table 9, we are unable to document a relation between book values and cumulative holding period returns, or between *FSS* and short seller profits, for either the high or low coverage firms.

Price run-ups prior to short spikes are positively (negatively) related to cumulative holding period returns for the low (high) following firms and significantly greater for the subsample of low analyst coverage firms ($\Phi_5 = 0.1309$; significant at .05). This is in contrast to how investors interpret this firm characteristic at the time the short spike is revealed (see Tables 5 and 6). The coefficients on market value are reliably positive for both the high and low following firms, consistent with short sellers making higher profits by shorting smaller firms. In addition, the larger the percentage of the outstanding shares shorted in the low following firms, the more profitable the short position, as reflected in the coefficient on *SI* (significant at .10 for the low-following firms).

---

[19] Although these results are consistent with the short sellers' trading activities being on average profitable and with results reported in Desai et al. (2002), we made no adjustment for the risk of the positions, so we can offer no conclusion about the extent to which short sellers are earning positive risk-adjusted returns.

TABLE 9

Summary Statistics of Regression of Short Seller Profitability on Accounting Fundamentals and other Firm Characteristics Partitioned by "Low" and "High" Analyst Following

$$AR_{0,R} = \alpha_0 + \alpha_1 ANFOL + \alpha_2 RMONTH + LOW(\phi_1^L E_{q-1} + \phi_2^L \Delta E_q + \phi_3^L BV_{q-1} + \phi_4^L FSS + \phi_5^L AR_{0,+5} + \phi_6^L MV + \phi_7^L SI_0 + \phi_8^L AR_{0,+5})$$
$$+ HIGH(\phi_1^H E_{q-1} + \phi_2^H \Delta E_q + \phi_3^H BV_{q-1} + \phi_4^H FSS + \phi_5^H AR_{0,+5} + \phi_6^H MV + \phi_7^H SI_0 + \phi_8^H AR_{0,+5}) + \varepsilon_{Qt}$$

	Intercept	***ANFOL***	***RMONTH***	E_{q-1}	ΔE_q	BV_{q-1}	*FSS*	$AR_{-60,-21}$	*MV*	*SI*	$AR_{-0,+5}$
	.0874	−0.0447	−0.0054								
LOW				0.0314	0.0038	−0.0095	0.0154	0.1309**	0.0292**	−0.5536*	1.1182***
HIGH				−0.2830***	0.4144***	0.0090	−0.0328	−0.0624*	0.0154***	−0.0738	0.9490***
F-statistics: $\Phi^L = \Phi^H$				8.30***	17.95***	0.80	0.33	7.60***	1.51	1.41	0.98
Adj. R^2	.186										
n	1,207										

***, **, * Denote significance at the 0.01, 0.05, and 0.10 levels, respectively, based on two-tailed tests.

LOW (*HIGH*) is a dummy variable set to 1 if analyst following is less than or equal to (greater than) 1. *ANFOL* is a dummy variable set to 1 if analyst following is less than or equal to 1. The sample consists of only those firms whose short interest has reverted to pre-spike levels by month 12. In addition, observations were removed as outliers if their respective absolute student t-statistics were greater than 3.0 (see Belsley et al. 1980).

Finally, the announcement period returns, $AR_{0,+5}$, are strongly related to short sellers' profits. The coefficient on announcement period returns for low analyst following firms is 1.1182, consistent with short sellers earning slightly more on average than the immediate return at the announcement of the new positions (since their positions are taken before day 0). The coefficient on the announcement period return is 0.9490 for the high following firms, again significantly different from zero and suggesting that short seller profits are strongly associated with investors reaction at the announcement of the new position. Re-estimating Equation (4) by including an indicator variable for short spikes lasting more than eight months (results not tabulated) does not change the coefficients on announcement period returns, but yields a significant coefficient on the indicator variable of −0.0610, suggesting that short seller profits on positions of long duration are an additional 6.1 percent beyond profits on the average short spike. Taken together, these results are consistent with the univariate statistics in Table 8, and suggest that investors correctly interpret the implications of short interest for firm valuation on the date it is announced, and that those implications are negative for the short positions that are most likely to be implicit sell recommendations issued by short sellers as information intermediaries. Only when the short sellers hold their risky positions for more than eight months do the short sellers make profits substantially in excess of the stock price reaction at the time of the initial announcement.

VI. CONCLUSIONS

In this paper we examine whether investors respond to disclosures of abnormal increases in short selling (i.e., a "short spike") and what characteristics of the firm help explain this response. Our inquiry is based on understanding the role that short sellers play as information intermediaries. An increase in shorted shares is by definition a position designed to benefit from an anticipated stock price decline. Short sellers are known to engage in rigorous search activities for overvalued firms, and thus can serve as complements to financial analysts for smaller firms for which analyst coverage is low or for other firms for which analysts tend not to provide forecasts when their expectations are not favorable (McNichols and O'Brien 1997).

For the years 1989 through 1998 we examine 2,304 instances where NYSE-listed firms experience an abnormally large increase in short interest not likely related to positions designed to hedge anticipated interest rate or regulatory changes. We use monthly short interest levels reported by the New York Stock Exchange and control for both the historical firm-specific level of short interest changes and contemporaneous market-wide movements in short selling. We find that on average the abnormal return around the short spike announcements are negative but very modest. Multivariate analyses, however, reveal that abnormal returns around short spikes are more pronounced for firms with at most one analyst covering the firm. Conversely, for firms with higher analyst following we find the market response increasingly dependent on these firms' earnings levels; no such relation exists for firms with low analyst following. In our models we control for other variables that potentially influence investors' interpretation of short spikes: weak accounting fundamentals (Lev and Thiagarajan 1993; Abarbanell and Bushee 1997), proxies for price bubbles (Staley 1997; Asensio 2001), and the expected costs of short selling (Senchack and Starks 1993; Desai et al. 2002; Diamond and Verrecchia 1987). The association of earnings with the market response to short spikes is also not related to the level of firm's accruals relative to cash from operations, a common proxy often used to assess earnings quality.

Finally, we also examine whether the same set of factors help explain short seller profitability. We find that for our sample, short sellers are on average profitable and the initial market response to the short spike is related to the cumulative holding period return ultimately earned by short sellers. Short positions appear to be modestly more profitable for firms for which there is low analyst coverage, indicating greater returns to their search activities for these firms. We also find that when analyst coverage is high, the level of earnings and earnings changes is associated with short seller returns. This provides some evidence that in the presence of analyst coverage, short sellers' returns are influenced to a greater extent by their ability to identify firms whose earnings are not sustainable.

As a whole, our study provides evidence that investors view short interest disclosures as informative signals about the firm. In this regard we increase our understanding of short sellers as information intermediaries and extend prior research, conclusions of which suggest that investors potentially ignore information embedded in short-selling disclosures. We conclude that the market response to short selling is contextual. The firms' existing information environment, proxied for by analyst following, affects both the level of investors' response and the influence of other firm characteristics on that response. These findings complement prior research documenting that firms more heavily followed are priced on a more timely basis (Ayers and Freeman 2003). As information intermediaries, short sellers help mitigate these timing differences, with their perceived value highest when there are limited alternative sources of guidance.

REFERENCES

Abarbanell, J. S., and B. Bushee. 1997. Fundamental analysis, future earnings, and stock prices. *Journal of Accounting Research* 35 (Spring): 1–24.

Asensio, M. 2001. *Sold Short—Uncovering Deception in the Markets.* New York, NY: J. Wiley.

Asquith, P., and L. Meulbroek. 1996. An empirical investigation of short interest. Working paper, Harvard Business School.

Ayers, B. C., and R. N. Freeman. 2003. Evidence that analyst following and institutional ownership accelerate the pricing of future earnings. *Review of Accounting Studies* 8: 47–67.

Belsley, D. A., E. Kuh, and R. E. Welsch. 1980. *Regression Diagnostics: Identifying Influential Data and Sources of Collinearity.* New York, NY: John Wiley & Sons.

Brennan, M., N. Jegadeesh, and B. Swaminathan. 1993. Investment analysis and the adjustment of stock prices to common information. *Review of Financial Studies* 6: 111–138.

Brent, A., D. Morse, and E. Stice. 1990. Short interest: Explanations and tests. *Journal of Financial and Quantitative Analysis* (June): 273–289.

CCH Inc. 1997a. *Law, Explanation and Analysis: Taxpayer Relief Act of 1997.* Chicago, IL: CCH Inc.

———. 1997b. *Internal Revenue Code: Income Taxes Sections 1-999.* Chicago, IL: CCH Inc.

D'Avolio, G. D. 2002. The market for borrowing stock. *Journal of Financial Economics* 66: 271–306.

Dechow, P., A. Hutton, L. Meulbroek, and R. Sloan. 2001. Short-sellers, fundamental analysis, and stock returns. *Journal of Financial Economics* 61: 77–106.

Desai, H., R. Thiagarajan, K. Ramesh, and B. Balachandran. 2002. An investigation of the informational role of short interest in the Nasdaq market. *Journal of Finance* (October): 2263–2287.

Diamond, D., and R. Verrecchia. 1987. Constraints on short-selling and asset price adjustment to private information. *Journal of Financial Economics* 18 (June): 277–311.

Fabozzi, F. 1997. *Securities Lending and Repurchase Agreements.* New Hope, PA: Frank J. Fabozzi Associates.

Fama, E., and K. French. 1992. The cross-section of expected stock returns. *Journal of Finance* (June): 427–465.

Jones, C. M., and O. A. Lamont. 2002. Short-sale constraints and stock returns. *Journal of Financial Economics* 66: 207–239.

Lakonishok, J., A. Shleifer, and R. Vishny. 1994. Contrarian investment, extrapolation, and risk. *Journal of Finance* (December): 1541–1578.

Lev, B., and R. Thiagarajan. 1993. Fundamental information analysis. *Journal of Accounting Research* 31 (Autumn): 190–215.

McNichols, M., and P. C. O'Brien. 1997. Self-selection and analyst coverage. *Journal of Accounting Research* 35 (Supplement): 167–199.

Miller, E. 1977. Risk, uncertainty, and divergence of opinion. *Journal of Finance* 32: 1151–1168.

New York Stock Exchange (NYSE). 1997. *Information Memo 97–33* (Rule 440–B). New York, NY: NYSE.

Piotroski, J. 2000. Value investing: The use of historical financial statement information to separate winners from losers. *Journal of Accounting Research* 38 (Supplement): 1–41.

Reed, A. 2001. Costly short-selling and stock price adjustment to earnings announcements. Working paper, Wharton School, University of Pennsylvania.

Richardson, S. 2003. Earnings quality and short sellers. *Accounting Horizons* (Supplement): 49–61.

Securities and Exchange Commission (SEC). 1999. *Short Sales.* SEC Concept Research No. 34-42037. File S7-24-99. October. Washington, D.C.: Government Printing Office.

———. 2003. Implications of the growth of hedge funds. Available at http://www.sec.gov/news/studies/hedgefunds0903.pdf.

Senchack, A., and L. Starks. 1993. Short-sale restrictions and market reaction to short-interest announcements. *Journal of Financial and Quantitative Analysis* (June): 177–194.

Sloan, R. G. 1996. Do stock prices fully reflect information in accruals and cash flows about future earnings? *The Accounting Review* 71 (3): 289–315.

Staley, K. 1997. *The Art of Short Selling*. New York, NY: J. Wiley.

THE ACCOUNTING REVIEW
Vol. 80, No. 3
2005
pp. 967–1003

Accounting Recognition of Intangible Assets: Theory and Evidence on Economic Determinants

Anne Wyatt
University of Melbourne

Abstract: This paper examines the extent to which management makes accounting choices to record intangible assets based on their insights into the underlying economics of their firm. It exploits a setting in which management has accounting discretion to record a wide range of intangible assets. The results suggest that management's choice to record intangible assets is associated with the strength of the technology affecting the firms operations, the length of the technology cycle time, and property-rights-related factors that affect the firm's ability to appropriate the investment benefits. These effects are more important than other contracting and signaling factors consistent with the underlying economics operating as a first-order effect as envisaged by GAAP. The results also indicate that the intangible assets management has a voluntary (unregulated) choice to record—identifiable intangible assets—are more highly correlated with underlying economic factors than the regulated classes, purchased goodwill and R&D assets. This result suggests that limiting managements' choices to record intangible assets tends to reduce, rather than improve, the quality of the balance sheet and investors' information set.

Keywords: *technology; property rights; intangible assets; financial reporting.*

Data Availability: *Data are available from sources identified in the paper.*

Sincere thanks to two anonymous referees for their help in improving this paper; thanks to dissertation advisors, Zoltan Matolcsy and Donald Stokes, and to Margaret Abernethy, Jan Bouwens, Phillip Brown, Steven Cahan, Graeme Dean, David Emanuel, S. P. Kothari, Baruch Lev, Kim Sawyer, Terry Shevlin, Nasser Spear, Max Stevenson, Ann Tarca, Terry Walter, and Elizabeth Webster, for helpful comments. Many thanks to the discussant and participants at AAANZ Hamilton Island, and seminar participants at the Australian National University, University of Auckland, University of Glasgow, New York University, University of Melbourne, University of Technology, Sydney/University of Sydney Summer School, University of Queensland, University of Western Australia. The author is grateful for research funding from AAANZ, University of Technology, Sydney, and University of Southern Queensland.

Editor's note: This paper was accepted by Patricia Dechow, Editor.

Submitted September 2003
Accepted November 2004

I. INTRODUCTION

Generally Accepted Accounting Principles (GAAP) place limits on management's ability to record intangible assets.[1] These limits are motivated by economic uncertainty associated with payoffs from the assets and information asymmetry surrounding managements' incentives.[2] The GAAP limits are designed to improve the information quality in financial markets. At the same time, policy makers are also conscious of the information gap in this area. For example, on January 9, 2002, the FASB added the project *Disclosure of Information about Intangible Assets Not Recognized in Financial Statements* to its technical agenda. The International Accounting Standards Board also attempted to redress the gap with IAS No. 38, *Intangible Assets* (IASB 1998). Hampering these efforts is a gap in our knowledge of the determinants of the accounting choice to record intangible assets. While we know contracting and signaling can influence the choices in some contexts, thus far, another fundamental question is largely unaddressed. This question is the extent that managements' choices to record intangible assets are based on their insights into the underlying economics of their firm.[3]

This paper addresses this gap in the accounting choice literature by exploiting a unique setting where management has discretion to record intangible assets. The paper examines whether the choices to record intangible assets depend on prevailing technology conditions including the "strength of the technology," the "length of the technology cycle time," and "property rights related factors" that affect the firm's ability to appropriate the expected investment benefits. The paper also provides insights on the "value" of giving management accounting discretion under GAAP. Specifically: Do different types of intangible assets (goodwill, R&D assets, identifiable intangible assets) correlate differently with the underlying economic factors? Do investors value each type of intangible asset differently? The setting this study exploits permits management to record a range of intangible assets including acquired goodwill and identifiable intangible assets, R&D assets, and internally generated identifiable intangible assets.

This study contributes to accounting research in several ways. First, intangible assets are difficult for outsiders to observe and monitor. This characteristic leads to concerns that the wider discretion called for by some commentators, will open the floodgate for accounting manipulation. However, several studies conclude that, in some circumstances, giving management discretion under GAAP could improve the ability of earnings to predict performance.[4] This study contributes new evidence on the extent that management exercise their discretion to report intangible assets in ways that can inform investors. Second, intangible asset information presents a challenge to investors in disentangling the real economic implications from contracting and signaling motives that may not be informative about cash flows directly attributable to the intangible assets. Researchers show that contracting and signaling incentives motivate management to record intangible assets in some institutional contexts (e.g., Anderson and Zimmer 1992; Muller 1999). Such findings offer important insights on the incentives that impact management's choices, but leave open the more elementary question of the extent to which fundamental economic factors are a first-order effect. Moreover, accounting choice research finds it difficult to discriminate between efficient choices and other motives (e.g., Ball 1980; Christie and Zimmerman 1994; Fields et al. 2001). By explicitly focusing on the underlying economics of the firm's intangible investments, this paper facilitates inferences about the existence or otherwise of efficient accounting choices.

---

[1] For example, U.S. GAAP requires immediate expensing of most internally generated intangible assets.

[2] The earnings-generation process is usually knowable, albeit risky, for plant, property, and equipment. However "Knightian" uncertainty, rather than risk of an actuarial type, attends intangible assets that are unobservable and often without property rights (Knight 1921; Webster 1999). Knight (1921) defined "uncertainty" that involves an increase in variance as "risk" whose properties include a single distribution with known parameters. He defined "uncertainty" that involves a decrease in confidence as "true uncertainty." In contrast to risk, "true uncertainty" cannot be characterized by a single distribution and known parameters.

[3] Few papers consider real influences on accounting choices. Studies of accounting choice for intangible assets tend to focus on contracting and signalling in specific contexts (e.g., in Muller [1999] brand capitalization is explained by London Stock Exchange rules). General exceptions include the LIFO/FIFO inventory model developed by Lindahl (1989), consolidation choices in Whittred and Zimmer (1994), and the asset write-down study by Chia (1995). Intangibles studies include Aboody and Lev's (1998) use of production function attributes for software firms, and the simulation study of R&D in Healy et al. (2002).

[4] For example, discretion over: software developers' costs in Kasznik (1997), R&D accounting in Healy et al. (2002), and impairment choices for extractive companies in Boone and Raman (2003).

The paper tests three hypotheses using an innovative technology database with limited use in the literature and a sample of Australian companies for 1993–1997. The first hypothesis predicts a positive relation between technology strength and recorded intangible assets. The strength construct relates to the profitability potential of a technology. Firms whose operations are exposed to higher strength technologies have incentives to invest and they accumulate valuable intangible assets in the process (i.e., embedded in technology and from learning) (Grenadier and Weiss 1997). The managers of these firms are therefore more likely to record intangible assets.[5]

The second hypothesis predicts a negative relation between the technology cycle time and recorded intangible assets. Cycle time refers to the number of years it takes for a new idea to develop to commercial viability. As cycle time decreases, the intensity of intangible investment, and the stock of intangible assets, increases. There is a shorter lag to cash inflows and a lower risk that assets become obsolete. It is therefore expected that managers of these firms are more likely to record intangible assets.

The third hypothesis relates to the property rights problem associated with intangible assets. Lack of control affects the firm's ability to appropriate (capture) the expected investment benefits. A positive relation is predicted between proxies for the firm's ability to appropriate expected benefits and recorded intangible assets. Specifically, recorded intangible assets are expected when (1) the technology is science-based and complex; (2) information about the firm's investments is already in the public domain; and (3) firms are engaged in higher levels of innovation and rent-seeking.

The results are consistent with these predictions. Recorded intangible assets (relative to total assets) are positively associated with technology strength and the proxies for the ability of the firm to appropriate investment benefits, and negatively associated with the length of the technology cycle time. The robustness of the results varies across the study period consistent with other factors also influencing the choice.[6] However, the competing explanatory variables for contracting and signaling incentives explain only a small proportion of this variation. The results thus suggest the firms' underlying economics plays an important role in managements' choices to record intangible assets—a more important role than contracting and signaling factors, consistent with the underlying economics operating as a first-order effect, as envisaged by GAAP.

Further, the intangible assets which management have a "voluntary" (i.e., unregulated) choice to record—identifiable intangible assets—are more highly correlated with underlying economic factors compared to the two less discretionary classes, purchased goodwill and R&D assets. The former are also more highly valued by investors compared to the two other classes. Limiting the choice to record intangible assets would thus tend to reduce, rather than improve, the quality of the balance sheet and investors' information set. Overall, these findings suggest investors and firms can benefit from this discretion and the concerns about wholesale manipulations are overstated (at least in the Australian setting).

---

[5] Given assets in most jurisdictions are "probable future economic benefits obtained or controlled by a particular entity as a result of past transactions or events" (SFAC No. 6, FASB 1980).

[6] This could be due to measurement error, although, a patent supports the validity of the data: U.S. Patent No. 6175824 Method and Apparatus for Choosing a Stock Portfolio Based on Patent Indicators.

The remainder of the paper proceeds as follows. Section II develops the theoretical framework. Section III describes the research design. Section IV provides the empirical analysis and the conclusions are discussed in Section V.

II. THE FIRM'S UNDERLYING ECONOMICS AND THE ACCOUNTING CHOICE TO RECORD INTANGIBLE ASSETS

Figure 1 provides an overview of the theory developed in this section. Starting at the top of Figure 1, two sets of underlying economic conditions arising from the broad business environment are identified. One set depicted on the left-hand side of Figure 1, are the external technology conditions facing the firm. "Technology" is defined as ways to make and do things (Metcalfe 1998). A "technology area" (to which technology conditions refer) is a pattern of innovation and technological progress (Dosi 1988). Audretsch (1995) and others show that technology conditions are endogenous to cycles of firm start-up, growth, and exit.[7] The two technology conditions identified in this paper are the strength of the technology and the length of the technology cycle time. These two are structural features that define the nature of the inputs to the firms' production functions and their costs as well as the manner in which these inputs are combined. As summarized in Figure 1, these two conditions provide management with information about potentially profitable investment opportunities and the time lag to the expected benefits. This information is expected to map into the accounting choices through its influence on investment incentives and managements' beliefs about the predictability of future benefits from the investments.

As summarized in Figure 1 on the right-hand side, the second set of underlying economic factors, the property rights conditions, relates to the firm's ability to obtain control rights over its assets. This is an important underlying economic condition because it affects the firm's ability to appropriate investment benefits. Property rights conditions provide management with information about the availability of control rights and the probability their firm can appropriate the expected investment benefits. Formal systems for obtaining property rights over intangible assets include the legal system, contract law, and registration systems for patent, trademark, and design rights. Informal systems include complex knowledge structures and factors affecting the firm's information environment and stock of intangible assets such as trade secrecy, superior internal competencies and employees, alliances, brand name, and market share.

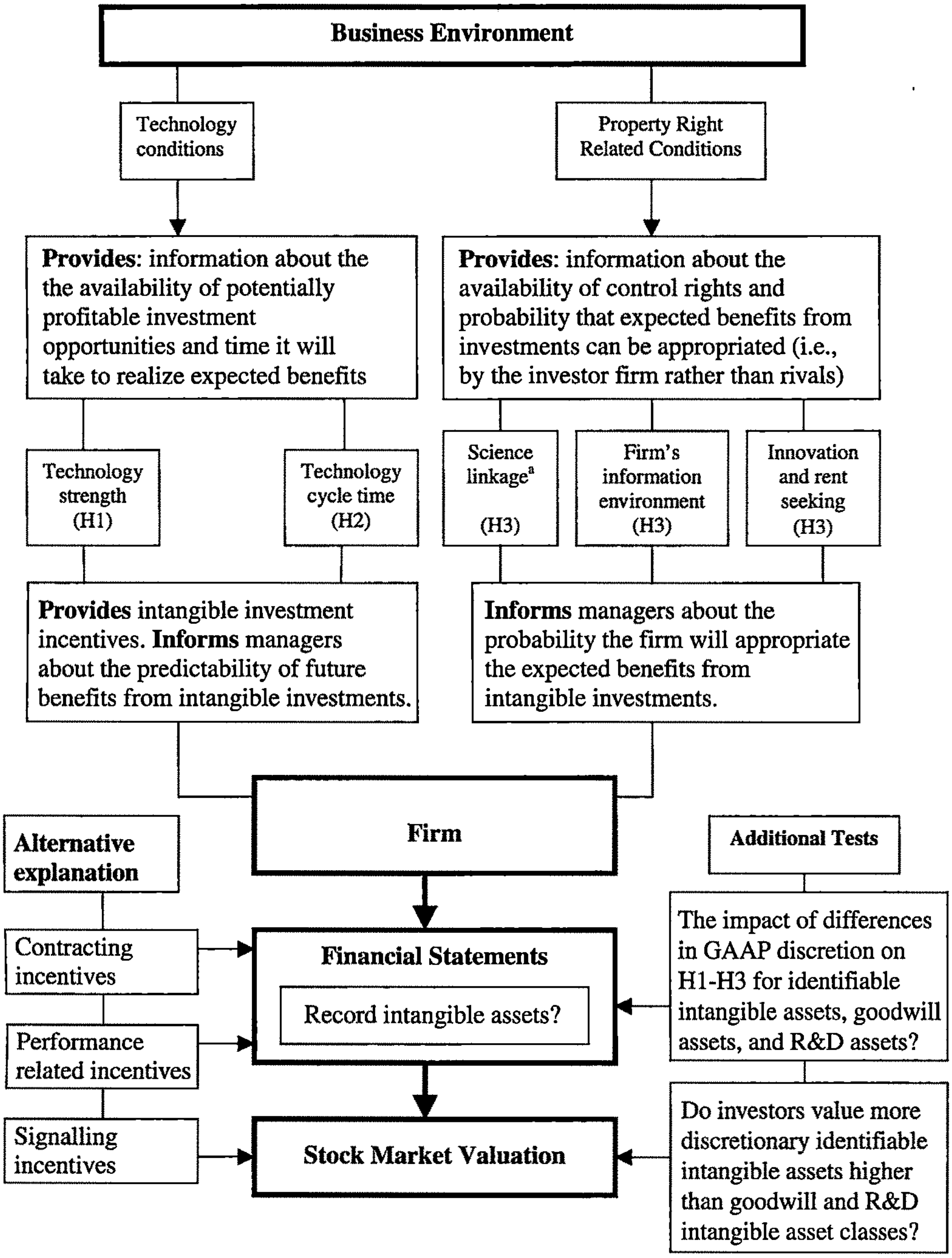
Technology Strength Links to the Accounting Choice to Record Intangible Assets

Technology strength relates to the state of technological progress and knowledge within a technology area (Narin 1995; Grenadier and Weiss 1997). A technology area develops from the cumulative activities of economic agents over time in developing knowledge from technical and/or scientific sources (Dosi 1988). At any time, there are differences in profitability potential across technology areas due to differences in the availability and expected value of investment opportunities. When firms' operations are exposed to higher

---

[7] See Usher (1954), Penrose (1959), Nelson (1987), Dosi (1988), Rosenberg (1994), and Metcalfe (1998). Technology is important to all firms as either net users or net producers. The World Intellectual Property Organisation provides the Intellectual Property Classification (IPC) (see http://www.wipo.com).

FIGURE 1
Overview of the Theoretical Framework


Business Environment
Technology conditions
Property Right Related Conditions
Provides: information about the the availability of potentially profitable investment opportunities and time it will take to realize expected benefits
Provides: information about the availability of control rights and probability that expected benefits from investments can be appropriated (i.e., by the investor firm rather than rivals)
Technology strength (H1)
Technology cycle time (H2)
Science linkage[a] (H3)
Firm's information environment (H3)
Innovation and rent seeking (H3)
Provides intangible investment incentives. Informs managers about the predictability of future benefits from intangible investments.
Informs managers about the probability the firm will appropriate the expected benefits from intangible investments.
Firm
Alternative explanation
Contracting incentives
Performance related incentives
Signalling incentives
Financial Statements
Record intangible assets?
Stock Market Valuation
Additional Tests
The impact of differences in GAAP discretion on H1-H3 for identifiable intangible assets, goodwill assets, and R&D assets?
Do investors value more discretionary identifiable intangible assets higher than goodwill and R&D intangible asset classes?

---

[a] "Science linkage" refers to the extent that a technology is science-based and, hence, complex and difficult for rivals to imitate.

profitability/higher impact technologies, they are more likely to take advantage of investment opportunities as they emerge (as opposed to waiting until uncertainty is resolved) (Grenadier and Weiss 1997). On average, these firms accumulate valuable intangible assets (i.e., embedded in technology and from learning), which would otherwise be forgone, from this sequential investment. Accordingly, there is lower uncertainty about investment outcomes compared to firms exposed to lower strength technologies (Grenadier and Weiss 1997). Proprietary information costs of disclosure, and disincentives to disclose, should also be lower because informed investors will have incentives to seek information about these (higher strength) technologies (McNichols and O'Brien 1997). This puts more information relevant to the firm's operations in the public domain, thereby stemming concerns about proprietary costs of disclosure. A positive relation is therefore expected as follows:

H1: Recorded intangible assets are positively related to technology strength.

Technology Cycle Time Links to the Accounting Choice to Record Intangible Assets

Technology cycle time is the average time to embody new technology in commercially viable products (Narin 1995). For example, innovations in shipping have long 15- to 30-year cycles, while software cycles are often less than a year. The cycle time is a structural feature that is determined by the specific knowledge base of a technology area, demand for the technology, and its maturity (Dosi 1988; Agarwal and Audretsch 2001). Shorter cycles decrease the lag to cash inflows and increase their present value, and decrease the risk of asset obsolescence (Grenadier and Weiss 1997). Intangible investment also increases in intensity as the cycle time decreases (Scherer 1966; Graves 1989). This reflects the "time-to-market" basis of competition and the escalating costs of competition.[8] A negative relation is predicted between recorded intangible assets and the cycle length because the intensity of intangible investment mechanically results in a higher stock of intangible assets, while the shorter lag to cash inflows and lower risk of obsolete assets decreases the uncertainty of future benefits.

H2: Recorded intangible assets are negatively related to technology cycle time.

Property Rights and the Firm's Ability to Appropriate the Expected Benefits

Securing and defending property rights is an endemic problem for intangible investment. The value may be tied up in people who cannot be "owned" or else attributable to rents that are easily copied and dissipated by rival firms (e.g., brands) (Webster 1999). The investments are often directly exposed to business environment uncertainties and rapid value changes. This exposure follows from the role of intangible investment as a "control response"—to minimize uncertainty by reducing the number of uncontrolled factors affecting operations (Webster 1999). The investments fulfill this role by increasing management's informedness about the set of possible future states and their probability of occurrence.[9]

Information to form expectations about the investment benefits, and the firm's ability to appropriate them, is integral to managements' asset recognition choices under GAAP.

---

[8] These costs have a material intangible component because competitive "capabilities" are typically knowledge and competency based (see Ittner and Larcker 1997).

[9] An example of investment in innovation that increased management's informedness about the set of possible future states and their probability of occurrence is the development of hybridization techniques that allowed the production of patentable plant seeds. Before the 1960s, new seed development was plentiful but property rights were not. However, hybrid seeds are sterile and can only be produced by the companies that control the original pure seeds (see Boldrin and Levine 2004, 130). In addition, see Rosenberg (1998, 18–31) for a discussion of technology-related uncertainties.

Legal rights are one piece of information that can inform management about the predictability of future benefits. However, they are not a GAAP precondition to record assets. In practice, managers tend to base their judgment on regularities in business conditions.[10] This leads to the following prediction, which is operationalized and tested as described below:

> **H3:** Recorded intangible assets are increasing in the level of the firm's ability to appropriate the benefits from intangible investment.

The ability to appropriate benefits is expected to be greater when (1) the technology is science-based and complex; (2) information about the firm's investments is already in the public domain; and (3) firms are engaged in more innovation and rent-seeking.

Appropriability Conditions—Science Linkage of the Technology

"Science linkage" refers to the extent that a technology is science-based. Science-based technologies are complex and difficult for rivals to imitate due to greater proportions of tacit over universal knowledge (Polanyi 1967; Metcalfe 1995, 455–462). This positively influences the firm's ability to protect and appropriate expected benefits. A higher, tacit knowledge base also implies higher information asymmetry with investors. This higher level of information asymmetry gives rise to an added incentive to inform investors who know they are relying on less complete information (Richardson 2001). A positive relation is predicted between "the extent the technology is linked to science" and recorded intangible assets.

Appropriability Conditions—Information Environment

First, established firms have strong "cost of capital" incentives to provide information about unobservable assets. This incentive is bolstered by the established firm's advantage, due to their scale and scope, to obtain control rights over intangible assets. This alleviates the need to keep the assets a secret. A second information effect arises from the stage of the firms' projects. As a firm's projects advance, information about intangible assets filters into the public domain. The associated intangible assets also tend to bundle with (become embodied in) other assets comprising control rights, thereby becoming more "tangible" and less risky (Geroski 1995). It is therefore predicted that established firms, and those firms with more advanced projects, will record relatively higher levels of intangible assets.

Appropriability Conditions—Innovation and Rent-Seeking

In general, to have a competitive advantage firms need to put high-quality skills and resources in place.[11] Management can then invest these high-quality resources in a continual process of innovation to produce new products, services, and technologies to keep the firm ahead of rivals. Rent-seeking is the investment of the firm's high-quality resources to create short-term monopolies over the firm's innovations (e.g., a legal monopoly in the form of a patent, trademark, design, no-compete contract, and short-term "private" monopolies created by making the innovation difficult for rivals to observe and reproduce). Investing high-quality resources in innovation and rent-seeking, among other things, generates valuable growth opportunities for the firm. A positive relation is therefore predicted between innovation and rent-seeking, and recorded intangible assets.

---

[10] If this were *not* the case, then managers would have no basis for policy formulation (Metcalfe 1998). Nelson (1987) argues this guided element explains the rate of progress in capitalist market economies.

[11] Rents are earned whenever a factor of production generates a return that exceeds the minimum return necessary to retain the factor in its present use (Marshall 1920).

Contracting and Signaling Incentives

This section discusses competing explanations from the prior accounting literature for managements' choices to record intangible assets.

Debt Contracts

Managers of higher leveraged firms may have incentives to record intangible assets to loosen debt covenant restrictions and thereby increase the firm's capacity to service the debt and access new debt.[12] A positive relation between leverage and recorded intangible assets is therefore predicted. If the firm experiences pressure on revenues, then managers of higher leveraged firms may also have incentives to decrease spending on intangible investments. Accordingly, a variable is employed to control for future expected economic conditions: the industry average of managements' expectations of medium-term growth in industry profits, with a positive sign expected.

Operating Performance

Ceteris paribus, firms with incentives to report intangible assets would be those with intangible assets that management expects will lead to superior, future performance. These firms, with "maturing" intangible assets, usually have relatively lower, current operating cash flows and earnings. A negative relation is therefore predicted between recorded intangible assets and (1) a cash-flow-based performance measure comprising operating cash flow divided by tangible assets (i.e., prior to recording intangible assets); and (2) earnings-yield (earnings per share divided by stock price).[13]

Signaling Incentives

Recording of otherwise, unobservable intangible assets could signal expected growth to investors and help differentiate the firm from lower quality firms (e.g., Leland and Pyle 1977; Hughes 1986). Given the critical importance of access to capital markets at the lowest possible cost, it is predicted that there is a positive relationship between the firm's recording of intangible assets and an initial public offering, or a secondary issue of debt and/or equity.

III. RESEARCH DESIGN

Hypothesis tests are conducted in the Australian setting where companies commonly record intangible assets. The study period 1993–1997 is used as it represents a period that is relatively stable and free from major regulatory change. The sample includes both companies that do and do not record intangible assets. This facilitates a test of the association between technology and property-rights-related conditions and the accounting choice to record intangible assets.

The sample includes Australian Stock Exchange listed companies from a wide range of industries. This diversity in the sample is consistent with the implicit assumption in the theoretical framework that technology and property rights are important fundamentals that impact all industries. Regulated industry and agricultural firms are excluded because legislation and Australian GAAP impact on the assets and liabilities reported by these companies (i.e., excluded are banks and finance companies, insurance, investment and financial services companies, agricultural companies, and property and investment companies, and trusts in all sectors).[14] Table 1, Panel A provides details of the sample distribution across industries.

---

[12] Prior research also shows CEO cash compensation is positively related to earnings (Lambert and Larcker 1987; Sloan 1993) and differentially related to components of earnings that reflect stewardship aspects of management performance (Banker and Datar 1989; Dechow et al. 1994; Natarajan 1996). However, accounting conservatism and revenue recognition rules delay the recognition of revenue from intangible investment. This makes stock-based plans and nonfinancial performance measures more attractive for "intangibles" intensive firms (Ittner et al. 1997) and reduces the probability that recording intangible assets is motivated by the compensation earnings pool.

[13] Poor performers can mimic growth firms and record intangible assets. However, this is a visible manipulation, and such incentives, on average, tend to be mitigated by penalties from contract violations and the costs of bankruptcy (DeAngelo et al. 1994; Dechow et al. 1996).

Given the focus of this study is management's choice to record intangible assets, the dependent variable is the intangible asset number recorded on the balance sheet. To facilitate additional "value of management discretion" testing, the notes to the accounts were searched to collect separate classes including goodwill, R&D assets, identifiable intangible assets, the breakdown of identifiable intangible assets into specific subclasses, and finally deferred items not fitting the other categories.[15]

To obtain this level of detail, the financial accounting data were hand-collected from hard copy annual reports. Companies in the selected industries were identified from the Australian Stock Exchange Datadisk and contacted by telephone to obtain hard copy financial reports. Companies whose reports could not be obtained from the company or the Connect 4 Annual Report Collection for the years the company was listed between 1993–1997 are not included in the sample. The sample selection method underweights very small companies in the sample because these firms tend to fail at a high frequency and/or are unable to supply annual reports.[16]

The final sample with the required information comprises 1,366 firm-years. This involves between 225 and 296 firms per year. Seventy-nine percent of the individual firms for which financial reports could be obtained, are companies that were listed for the full five years of the study (1993–1997). The remaining 21 percent (92 firms) either went public in the study period (38 firms) or delisted in the study period. These latter two cohorts appear in the data as follows: eight firms are included for only one of the five study years; 14 firms for two years; 30 firms for three years; and 40 firms for four years. Table 1 shows the sample is fairly evenly spread across the sectors. Summary statistics reported in Table 2, Panel A illustrate the variability in the sample firms in terms of size, performance, excess valuation, secondary issues, and leverage.

Institutional Background

Table 3 summarizes the accounting choice set for intangible assets under Australian GAAP in the 1993–1997 period. The available set includes capitalization or immediate expense to income of purchased goodwill and R&D, and capitalization of acquired identifiable intangible assets at fair value. Similar to the recent FASB business combinations standard (SFAS No. 141), AASB No. 1015, *Acquisition of Assets*, requires identifiable intangible assets acquired in a business combination to be recorded at fair value.

Internally generated identifiable intangible assets (except internal goodwill) were unregulated in the 1993–1997 period, giving management wide discretion. As set out in Table

---

[14] Regulations include enabling and specific prudential legislation for banks, credit unions, building societies, general insurance and reinsurance companies, life insurance, friendly societies, and most members of the superannuation industry (http://www.apra.gov.au); company law (http://scaleplus.law.gov.au) and accounting standards including AASB No. 1023, *Financial Reporting of General Insurance Activities*, AASB No. 1038, *Life Insurance Business*, and AASB No. 1037, *Self-Generating and Regenerating Assets.*

[15] Deferrals include extractive industry exploration costs and items not fitting the other categories. The sum of all classes differs slightly from the number reported on the balance sheet as deferred items and some other items are classified as "Other Non-Current Assets" or "Plant, Property and Equipment."

[16] While a point to be aware of, these are the riskiest companies not representative of the population. ASX quoted companies are: 1,070 in 1993; 1,144 in 1994; 1,129 in 1995; 1,136 in 1996; and 1,159 in 1997.

TABLE 1
Sample Composition

Panel A: Distribution across Australian Stock Exchange Sectors (n = 1,366 firm-years)

ASX Sector		Count	Percent
11–15	**GOLD**—GOLD PRODUCER/EXPLORER/MINING/GOLD and COPPER	65	4.76
21–27	**OTHER METALS**—DIVERSIFIED MINING/BASE METALS/ MINERAL SANDS/BAUXITE/DIAMONDS/MINERAL EXPLORER	55	4.02
31–33	**DIVERSIFIED RESOURCES**—OIL, STEEL, MINING/ MINING,SMELTING	20	1.47
41–46	**ENERGY**—OIL/GAS PRODUCER/EXPLORER/INVESTMENT/ GAS DISTRIBUTION/COAL/URANIUM	105	7.69
52	**INFRASTRUCTURE and UTILITIES**	14	1.03
61	**DEVELOPERS and CONTRACTORS**—building, contractor	20	1.47
71–74	**BUILDING MATERIALS**—CEMENT/BRICK,PIPES,TILES/ TIMBER and BOARD	79	5.78
78	**MISCELLANEOUS INDUSTRIALS**—MISCELLANEOUS SERVICES	5	0.37
81–83	**ALCOHOL and TOBACCO**—BREWER/VINTNER/TOBACCO	50	3.64
91–96	**FOOD and HOUSEHOLD**—FOOD/FLOUR MILLER, BAKER/ SOFT DRINK and CONFECT/HOUSEHOLD GOODS,CHEMICALS	94	6.89
101	**CHEMICALS**—CHEMICALS/FERTILISERS/ CHEMICALS,FERT,PAINT	33	2.42
111–115	**ENGINEERING**—HEAVY ENGINEERING/MACHINERY MANUFACTURER/ENGINEERING CONTRACTOR/LIGHT ENGINEERING	113	8.27
122–126	**PAPER and PACKAGING**—FOREST PRODUCTS, TRADE/ PAPER MERCHANT/CAN MANUFACTURER/PLASTIC BOTTLES	23	1.69
131–137	**RETAIL**—RETAIL WHOLESALE RETAILER/ MANUFACTURER,RETAILER/RETAIL INVESTMENTS/ WHOLESALER RETAIL	77	5.64
141–144	**TRANSPORT**—TRANSPORT/INTERNATIONAL TRANSPORT/ OTHER SERVICES/SECURITY	26	1.89
151–155	**MEDIA**—DIVERSIFIED MEDIA/PUBLISHERS/TELEVISION/ ADVERTISING, MARKETING	98	7.17
182–184	**TELECOMMUNICATIONS**—CABLES/EQUIP, SERVICES/ OTHER	43	3.15
211–215	**HEALTHCARE and BIOTECHNOLOGY**—PHARMACY/ BIOTECHNOLOGY/HEALTH and MEDICAL/HEALTH and RELATED PRODUCTS	99	7.25
221–228	**MISCELLANEOUS INDUSTRIALS**—MISCELLANEOUS INDUSTRIALS/MISCELLANEOUS SERVICES/MINING SERVICES/AUTOMOTIVE and RELATED SERVICES/ COMPUTER AND OFFICE SERVICES/HIGH TECHNOLOGY	223	16.33
231	**DIVERSIFIED INDUSTRIALS**—DIVERSIFIED INDUSTRIAL	94	6.88
241, 243	**TOURISM and LEISURE**—CASINOS, GAMING/LEISURE ACTIVITIES	30	2.19
Total		**1366**	**100.00**

(*continued on next page*)

TABLE 1 (Continued)

Panel B: Sample Frequency for Individual Years for the Pooled Sample

	1993	1994	1995	1996	1997	Total	# Years Listed in 1993–97 Period	Firm Count	Firm/ Years	Percent %
Number of firms	225	267	286	292	296	1,366	1–3	52	126	9.0
Percentage of total sample	16.5	19.5	20.9	21.4	21.7	100.0	4–5	256	1240	91.0
								308	1,366	100.0%

Panel C: Intangible Asset Frequency of Recognition for the Pooled Sample

	RD/TA		*IIA/TA*		*GW/TA*		Intangible Assets Recorded from One or More Classes	
Recognize	Count	%	Count	%	Count	%	Count	%
No	1150	84.3	703	51.6	636	46.7	431	31.6
Yes	213	15.7	660	48.4	727	53.3	935	68.4
Total	1,363	100.0	1,363	100.0	1,363	100.0	1,366	100.0

RD/TA = research and development assets divided by total assets;
GW/TA = purchased goodwill divided by total assets; and
IIA/TA = identifiable intangible assets divided by total assets.
Based on examination of scatter and box plots, *INTANG/TA* (intangible assets reported on the balance sheet divided by total assets) has one extreme value deleted for Collins Motor Corporation in 1993 (total assets = $6,904,405 while total intangible assets = $6,894,400). The intangible asset variables have one missing observation in 1993 (Innovax Corporation) and two missing observations in 1995 (Harris Scarfe and Formulab Neuronics Corporations).

3, a conceptual framework statement, *Statement of Accounting Concepts* (SAC No. 4), provides asset definition and recognition criteria (similar to the FASB and IASB criteria). However, corporate compliance with SAC No. 4 is not mandatory. Recognition of internally generated goodwill is prohibited under AASB No. 1013, *Accounting for Goodwill*. This is not a well-defined item and, arguably, some recorded identifiable intangible assets fit the internal goodwill category (e.g., recorded items labeled as intellectual property or proprietary technology). Table 2, Panel B documents the types of identifiable intangible assets recorded by the sample firms. The formation, issue, and deferred cost items in Table 2 are excluded from the analyses because it is not clear they are assets.

Table 1, Panel C reveals that 68 percent of the sample firm-years recognize intangible assets of some kind. Sixteen percent recognize R&D assets, 48 percent recognize identifiable intangible assets, and 53 percent recognize goodwill. In Table 2, Panel A, the intangible asset to total asset mean (median) is 10 (2) percent. Untabulated statistics show 1,145 (84 percent) of the firm-years report intangible assets to total assets between 0 and 20 percent. Recording intangible assets (other than R&D assets) is therefore common, however, the magnitude is modest.

TABLE 2
Summary Statistics

Panel A: Summary Statistics for the Pooled Sample (1993–1997)

	Measurement Level	Mean	Median	Max.	Min.	Std. Dev.	Skew
INTANG/TA	Firm	0.10	0.02	0.99	0.00	0.16	2.20
RD/TA	Firm	0.01	0.00	0.81	0.00	0.06	7.38
GW/TA	Firm	0.03	0.00	0.60	0.00	0.07	4.07
IIA/TA	Firm	0.08	0.00	0.99	0.00	0.16	2.47
STRENGTH	Technology	820	178	7697	0.00	1494	2.69
CYCLE (years)	Technology	10.5	10.7	27.0	4.0	3.6	0.69
SCIENCE	Technology	1.74	0.88	24.8	0.00	3.59	4.28
SLS/MV	Firm	1.79	0.99	41.9	0.00	3.02	6.27
MV	Firm	6.79e+08	70783797	3.11e+10	315000	2.28e+09	8.12
CAP/MV	Firm	0.26	0.07	15.59	0.00	0.82	10.66
EV/MV	Firm	0.46	0.50	15.11	−6.85	0.88	7.41
RDINT	Industry	0.01	0.01	0.10	5.74e–05	0.02	3.63
ISSUE/MV	Firm	0.21	0.08	9.92	0.00	0.52	10.00
OP/TANG	Firm	0.04	0.08	1.52	−6.60	0.34	−11.70
YIELD	Firm	−1.55e–03	0.06	12.82	−10.35	0.57	2.82
LEV	Firm	0.35	0.34	0.99	1.47e–03	0.20	0.42
GROWTH	Industry	13.71	13.10	29.70	−29.80	8.06	−0.03
IPO	Firm	1 38 firm years 0 1328 firm years					
			Count	**Percentage**			
LIST	Firm	[1860, 1940)	68	4.98			
		[1940, 1960)	120	8.78			
		[1960, 1980)	286	20.94			
		[1980, 1997)	892	65.30			

(continued on next page)

TABLE 2 (Continued)

Panel B: Identifiable Intangible Assets Recognized by the Sample Companies

	1993 n = 224	1994 n = 267	1995 n = 284	1996 n = 292	1997 n = 296	Total n = 1,363
	Firm Freq.	Firm Freq.	Firm Freq.	Firm Freq.	Firm Freq.	Total Freq.
Patent, trademark, brand	35	39	45	41	47	207
Trademark, brand, license	31	40	51	52	53	227
Copyright, designs	4	3	5	4	5	21
Licenses	22	28	35	34	33	152
Intellectual property	7	10	14	10	13	54
Formation costs	29	36	36	37	35	173
Deferrals	67	77	86	85	85	400
Royalty, franchise and rights	8	4	8	6	5	31
Media (mastheads and publishing) rights	9	9	11	10	10	49
Issue costs	14	18	19	15	10	76
Mining tenements	7	7	10	7	7	38
Technology rights	9	9	16	12	13	59
System and software development	6	4	4	3	4	21
Database	2	1	6	4	5	18
Proprietary technology	5	4	6	4	7	26

INTANG/TA = intangible assets reported on the balance sheet divided by total assets;
RD/TA = research and development assets divided by total assets;
GW/TA = purchased goodwill divided by total assets; and
IIA/TA = identifiable intangible assets divided by total assets.

Formation costs, deferrals, and issue costs are not included in the variables employed in tests. Deferrals include extractive industry exploration costs and other items not fitting the other categories. All other variables are defined in Table 4. *CYCLE* has five missing values due to treatment of zero technology cycle time values as missing values. *EV* has one extreme value (52 times). *OP/TANG* has one extreme value excluded. *GROWTH* has six extreme values deleted (111.20).

TABLE 3
Summary of Accounting Methods for Intangible Assets under Australian GAAP for the 1993–1997 Time Period

Intangible Asset Categories	Applicable Accounting Standard	Accounting Method Choices
Purchased goodwill	AASB No. 1013 Accounting for Goodwill AASB No. 1015 Acquisition of Assets	—Capitalize using the purchase method and amortize —Immediately expense if no benefits expected —Annual impairment test
Acquired Identifiable intangible assets	AASB No. 1015 Acquisition of Assets AASB No. 1010 Accounting for the Revaluation of Non-Current Assets	—Capitalize at fair value —No specific standard for identifiable intangible assets subsequent to acquisition —No specific amortization requirement in the 1993–97 time period for intangible assets —In the 1993–97 study period upward and downward revaluations were permitted.[a]
Internally generated Identifiable intangible assets	No specific accounting standard Non-mandatory guidance in SAC No. 4 (Statement of Accounting Concepts No. 4) AASB No. 1010 Accounting for the Revaluation of Non-Current Assets	—Under SAC No. 4, an asset is future economic benefits controlled by the entity as a result of past transactions or other past events. It permits recognition when (a) it is probable future economic benefits embodied in the asset will eventuate; and (b) the asset possesses a cost or other value that can be measured reliably. —No specific amortization requirement in the 1993–97 time period for intangible assets —In the 1993–97 study period upward and downward revaluations were permitted.[a]
Research and Development	AASB No. 1011 Accounting for Research and Development	—Capitalize if benefits expected to exceed costs beyond reasonable doubt, otherwise immediately expense.

[a] However, the data indicates that upward revaluations of intangible assets are not common.

Measurement of Variables

Patents are widely used to construct technology conditions measures because they "provide a uniquely detailed source of information on inventive activity" (OECD 1994, 9). Patent measures are useful because technology areas and their "states" are outcomes from inventive (or innovative) activity of the firms, their rivals, and the wider economy in some instances (e.g., Schumpeter 1934; Metcalfe 1998). Further, patent-based metrics tend to have high construct validity because patent data covers virtually all technologies (Narin 1995). As this study focuses on technology conditions facing managers making operating and accounting decisions, data from a large competitive market are needed to obtain valid measures. For this reason, United States Patent and Trademark Office (USPTO) data are used. The data were obtained from CHI Research Inc., which compiles USPTO patent data commercially on an entity "unit" basis. The CHI Research database covers about 67 percent of all entities patenting into the United States patent market. CHI focuses on the prolific patentees because these are the entities creating technology areas and, hence, technology conditions. The World Intellectual Property Organization (WIPO) has a "technology area" classification (the Intellectual Property Classification [IPC]). CHI Research employs this IPC, rather than the USPTO classifications, as the IPC is industry-orientated and easier to interpret. CHI Research classifies all the prolific patenting entities into one of 26 industries.[17] The entities are then classified into one or more of 30 (simplified IPC) technologies within their industry (i.e., 26 × 30 = 780 possible technology areas).[18]

These 780 technology areas are the "units" of measurement for the purpose of this study. That is, the CHI entity unit data are aggregated to give averages for the 780 possible technology areas. As discussed in detail in the Appendix, to code the firms with the "technology area" unit data, the sample firms are classified into one of the CHI industries (one of 26) and then into one of the technologies within their industry (one of 30). Each company is then assigned the relevant measures of technology conditions for their dominant technology area. See the appendix for a full explanation.

CHI Research uses information disclosed in the USPTO patents to calculate several technology metrics on an annual basis.[19] Three of these are employed in this study to measure technology strength, technology cycle time, and science linkage. Table 4 summarizes the variables' definitions and measurements.

The metric employed to measure technology strength (*STRENGTH*) for tests of H1 is the "Number of Patents × Current Impact Index," which is an annual measure of the patent portfolio size in a technology area weighted by patent quality. The Current Impact Index indicates patent portfolio quality and equals the weighted sum of citation ratios for each of the past five years of patents, as cited in the current year by all USPTO patents. *Ceteris paribus*, technologies with highly cited, prior (five years of) patents are more important. The metric employed to measure technology cycle time (*CYCLE*) for tests of H2 is the median age in years of prior related patents cited on the front page of current patents. *CYCLE* is an annual measure that reflects the number of years elapsed from the previous patents upon which the current patent is improving and, hence, the rate that a technology is advancing. The metric employed to measure science linkage (*SCIENCE*), for tests of H3, is a count of the number of scientific papers referenced on the front page of the patents in a technology area. A higher value in any year indicates a technology is advancing on a scientific basis.

Measures of the firm's information environment for tests of H3 are as follows. The extent the firm is established is measured by: sales deflated by market value, the listing

---

[17] Industries are Aerospace; Automotive; Biotechnology; Chemicals; Computers; Conglomerates; Consumer Products; Electrical; Electronics; Energy; Engrng., Oil Field Svcs; Food, Bev. and Tobacco; Forest and Paper Prods.; Govt. Agencies; Health Care; Instrument. and Optical; Machinery; Materials; Metals; Misc. Companies; Pharmaceuticals; Research Institutes; Semiconductors; Telecommun.; Textiles; Universities.

[18] Technologies are Agriculture; Oil and Gas, Mining; Power Generation and Distribution; Food and Tobacco; Textiles and Apparel; Wood and Paper; Chemicals; Pharmaceuticals; Biotechnology; Medical Equipment; Medical Electronics; Plastics, Polymers and Rubber; Glass, Clay and Cement; Primary Metals; Fabricated Metals; Industrial Machinery and Tools; Industrial Process Equipment; Office Equipment and Cameras; Heating, Ventilation, Refrigeration; Misc. Machinery; Computers and Peripherals; Telecommunications; Semiconductors and Electronics; Measurement and Control Equipment; Electrical Appliances and Components; Motor Vehicles and Parts; Aerospace and Parts; Other Transport; Misc. Manufacturing; Other.

[19] This includes the class to which examiners have assigned the patent: citations to prior related patents and to scientific papers and patent counts.

TABLE 4
Variable Definition and Measurement

Theoretical Construct	Variable Denoted by	Measurement
Technology conditions		
Technology strength	*STRENGTH*	The number of patents granted in a technology area multiplied by a current impact index, which is a quality weight calculated as the technology area average of the number of times the previous five years of patents in the technology area are cited in the current year: firm i is coded on the metric for the relevant technology area for year t
Technology cycle time	*CYCLE*	Cycle time equals the median age in years of the patents cited on the front page of current patents in a technology area: firm i is coded on the metric for the relevant technology area for year t
Measures of the firm's ability to appropriate future benefits		
Technology science linkage	*SCIENCE*	Science linkage equals the average number of science references cited on the front page of patents granted in a technology area: firm i is coded on the metric for the relevant technology area for year t
Information environment	*SLS/MV*	Firm sales from operations divided by market value equity (*MV*) from firm i annual report for year t end
	LIST	The year the company listed on the Australian Stock Exchange
	MV	Number of ordinary shares multiplied by stock price for firm i in year t balance date
	CAP/MV	Capital commitment is equal to ending dollar amount of capital expenditure and lease commitments disclosed in the notes to the accounts (but not yet recorded on the balance sheet), divided by the market value equity, for firm i for year t end
Innovation and rent-seeking activity	*EV/MV*	Excess valuation equals (market value equity − [book value equity − intangible assets]) divided by market value equity from firm i annual report for year t balance date
	RDINT	Industry R&D intensity equals industry R&D to industry sales for year t (ABS Catalogue Nos. 8104.0 and 8140.0)
Contracting, operating performance, and signaling variables		
Debt contracts	*LEV*	[Debt divided by (market value equity + debt)] from the annual report for firm i for year t end
Operating performance	*OP/TANG*	Fiscal year net operating cash flows divided by tangible assets from the annual report for firm i for year t end
	YIELD	Diluted earnings per share divided by stock price for firm i for year t end
Signaling incentives	*IPO*	Dummy equal to 1 for the year in the 1993–97 period a firm first lists on the Australian Stock Exchange, and 0 otherwise, for firm i in year t
	ISSUE/MV	Sum of debt and equity issues from the annual report divided by the market value of equity for firm i for year t
Expected profit growth	*GROWTH*	Industry-level measure of managers' medium-term growth expectation for year t (survey data published in ABS Catalogue No. 5250.0)

year, and market value. Positive signs are predicted for sales and equity market value, and a negative sign for the listing year variable (defined as the year of listing). The listing and stock price data were collected from the ASX Datadisc and SIRCA. The stage of advancement of the firm's projects is proxied by capital commitments (deflated by market value). This amount is disclosed in a note to the accounts but is not (yet) quantified on the balance sheet. Higher values suggest the firm has more advanced projects.

The firms' innovation and rent-seeking, and the ensuing valuable growth opportunities, are not directly observable. Prior studies have employed market and R&D measures to capture the firms' stock of, and investment in, growth opportunities, respectively, (e.g., Smith and Watts 1992) and this approach is adopted in this study for tests of H3. The first measure is labeled excess valuation (*EV*) following Thomadakis (1977) and Connolly et al. (1986), and is measured as equity market value minus book value of tangible assets. Cohen et al. (2001) provide evidence that equity market value reflects the profitability outcomes of growth opportunities over the long run. The second measure is R&D intensity, equal to R&D expenditures divided by sales. Because Australian firms do not comprehensively report their R&D expenditures (Percy 1998), industry-level R&D expenditures and sales data from the Australian Bureau of Statistics are used.

IV. EMPIRICAL ANALYSES

The dependent variable, intangible assets divided by total assets, is left-censored at zero, meaning companies can have a ratio of intangible to total assets that is zero or greater than zero, but not less than zero. About 32 percent of the sample firm-years has zero values for the dependent variable, intangible assets divided by total assets. This is a major violation of the assumption underlying the ordinary least squares (OLS) estimator that the dependent variable is a continuous normal variable. It is not possible to obtain unbiased estimates from an ordinary least squares function. In this case, a Tobit estimator is the correct function (Greene 2000).

Equation (1) tests H1–H3. Equation (2) also includes the competing explanations:

$$\begin{aligned} y_{it} = {} & \Sigma_{y=93}^{97}\, \beta_{0y} YR_{yit} + \beta_1 STRENGTH_{it} + \beta_2 STRENGTH^2_{it} + \beta_3 CYCLE_{it} \\ & + \beta_4 CYCLE^2_{it} + \beta_5 SCIENCE_{it} + \beta_6 SCIENCE^2_{it} + \beta_7 SLS/MV_{it} + \beta_8 LIST_{it} \\ & + \beta_9 MV_{it} + \beta_{10} CAP/MV_{it} + \beta_{11} EV/MV_{it} + \beta_{12} RDINT_{it} + \mu_{it}; \end{aligned} \tag{1}$$

$$\begin{aligned} y_{it} = {} & \beta_0 + \beta_1 STRENGTH_{it} + \beta_2 STRENGTH^2_{it} + \beta_3 CYCLE_{it} + \beta_4 CYCLE^2_{it} \\ & + \beta_5 SCIENCE_{it} + \beta_6 SCIENCE^2_{it} + \beta_7 SLS/MV_{it} + \beta_8 LIST_{it} + \beta_9 MV_{it} \\ & + \beta_{10} CAP/MV_{it} + \beta_{11} EV/MV_{it} + \beta_{12} RDINT_{it} + \Sigma\beta_j COMPETING_{jit} + \mu_{it}. \end{aligned} \tag{2}$$

The relationship between the recorded intangible assets and the technology variables is modeled as a quadratic function. This is consistent with the extant literature that documents a nonlinear, S-shaped relationship between technology and investment-related variables (see the review by Geroski [2000]).[20] The positive (negative) signs predicted for technology strength and science linkage (technology cycle time), are expected to become negative (positive) for the quadratic terms as economic and competitive uncertainties impose limits on management's ability to predict intangible investment outcomes. The sales and market capitalization variables are in natural logarithm form. Results are reported from annual regressions and for pooled regressions, which include dummy variables for year effects. The variables and regression residuals have been screened and extreme outliers deleted (see the Table 1 and 2 notes for details). Hypothesis tests evaluate Z-statistics for the null hypothesis that regression coefficients equal zero. The Z-statistics are computed using Huber-White adjusted standard errors to correct for heteroscedasticity (White 1980), and clustering (Huber 1967; White 1982) due to coding the sample firms on categories of technology area and industry (R&D/sales) metrics.

---

[20] According to Eberly (1997), one cause of nonlinearity is that investment components generate different rates of return. These components are a fixed cost, a linear cost, and an adjustment cost reflecting uncertainty associated with competitive processes. As an integral element of this adjustment factor, the firms' intangible investments are not expected to be monotonically associated with technology conditions.

Correlations reported in Table 5 are consistent with the predicted positive and negative relations between the dependent variables and technology strength and technology cycle, respectively. Correlations with the other predictor variables, sales-to-market value, listing year, and market value vary with the dependent variable. The strongest correlations are for intangible assets and the identifiable intangible assets which, as predicted, are positively associated with technology strength, excess valuation and R&D intensity, and negatively correlated with technology cycle time and operating performance.

Primary Hypotheses Results

Estimates for Equations (1)–(2) are reported in Panel A of Table 6. These pooled regressions include untabulated fixed year effects. The results are consistent with H1 and H2: intangible assets (divided by total assets) are positively associated with technology strength and negatively associated with the length of the technology cycle. Moreover, the intercept is insignificant in Equation (1) suggesting that zero intangible assets will be recorded in the absence of technology strength.

As predicted in H3, the firm's ability to appropriate the benefits from intangible assets is also significantly associated with the choice to record intangible assets. Specifically, the information environment measures (sales-to-market value, market value, capital commitment) and the innovation/rent-seeking measure (excess valuation) are positively and significantly associated with the recorded intangible assets. However, the science linkage coefficient has the predicted positive sign but is not significant, while the listing year variable is positive, indicating that it is not the oldest companies (in listing terms) recording the intangible assets. The other innovation/rent-seeking measure, R&D intensity, has a positive and significant coefficient. However, it is not significant when the technology variables are also included (Table 6, Panel A in the column headed "Both"). This suggests R&D intensity is not as important as the technology conditions faced by the company in the choice to record intangible assets.

In Table 6, Panel A, Wald statistics computed from maximum likelihood estimation of the variance, compare the vectors of residuals from the restricted and unrestricted regression under the null hypothesis that the independent variable coefficients are zero. The F-statistics reported in the last column of Table 6, Panel A suggest that science linkage and R&D intensity are the only variables not systematically associated with the choice to record intangible assets. Table 6 also reports information criterion statistics, the Akaike and Hannan-Quinn statistics, which are model selection criteria for non-nested models.[21] The

---

[21] Akaike info criterion (AIC) [(−2(Log. L/t) + 2(k/t)] and Hannan-Quinn criterion (HQ) [(−2(Log. L/t) + 2kLog(Log(t))/t] where Log.L is a log likelihood function with k parameters estimated using t observations.

TABLE 5
Correlations

(Spearman Rank Correlations above the diagonal, Pearson Correlations below the diagonal)

	INTANG/TA	*GW/TA*	*RD/TA*	*IIA/TA*	*STRENGTH*	*CYCLE*	*SCIENCE*	*SLS/MV*	*LIST*	*MV*	*CAP/MV*	*EV/MV*	*RDINT*	LEV	OP/TANG	YIELD	ISSUE/MV	GROWTH
INTANG/TA		0.54**	0.18**	0.66**	0.12**	−0.17**	0.03	0.16**	0.09**	0.07*	0.15**	0.34**	−0.10**	0.17**	0.07*	0.07*	0.14**	−0.08**
GW/TA	0.30**		0.06*	0.10**	−0.04	0.01	−0.03	0.35**	−0.08**	0.16**	0.26**	0.03	−0.08**	0.23**	0.12**	0.17**	0.13**	−0.04
RD/TA	0.06*	−0.04		0.18**	0.11**	−0.26**	−0.02	−0.06*	0.01	−0.13**	−0.02	0.02	0.07**	0.01	−0.09**	−0.08**	0.01	0.01
IIA/TA	0.78**	−0.06*	0.01		0.17**	−0.22**	0.09**	−0.03	0.12**	0.07**	0.01	0.30**	−0.04	0.07*	0.01	−0.04	0.11**	−0.03
STRENGTH	0.26**	0.11**	0.09**	0.23**		−0.64**	0.29**	−0.18**	0.09**	−0.14**	−0.18**	0.10**	0.31**	−0.13**	−0.09**	−0.06*	−0.01	0.05*
CYCLE	−0.22**	−0.11**	−0.15**	−0.19**	−0.57**		−0.20**	0.18**	−0.11**	0.19**	0.20**	−0.19**	−0.30**	0.06**	0.13**	0.13**	0.00	0.01
SCIENCE	0.03	−0.02	0.06*	0.00	−0.08**	−0.17**		−0.17**	0.10**	−0.08**	−0.17**	0.10**	0.20**	0.15**	−0.13**	−0.15**	−0.02	0.09**
SLS/MV	−0.02	0.13**	−0.04	−0.08**	0.02	0.12**	−0.22**		−0.10**	−0.14**	0.53**	−0.37**	−0.19**	0.71**	0.17**	0.36**	0.09**	−0.10**
LIST	0.14**	0.02	0.06*	0.17**	0.10**	−0.17**	0.08**	−0.15**		−0.26**	0.01	0.15**	0.07**	−0.04	−0.09**	−0.03	0.13**	0.04
MV	0.01	−0.02	−0.13**	0.03	−0.15**	0.19**	−0.14**	0.10**	−0.33**		0.05*	0.19**	0.03	−0.15**	0.25**	0.06*	0.05*	0.04
CAP/MV	0.01	−0.01	−0.05	−0.01	0.01	0.12**	−0.06*	0.10**	−0.05*	−0.10**		−0.23**	−0.05*	0.49**	0.11**	0.14**	0.23**	−0.08**
EV/MV	0.24**	0.05	0.00	0.18**	0.02	−0.04	−0.01	−0.11**	0.02	−0.13**	−0.10		0.04	−0.31**	0.04*	−0.19**	−0.03	0.04
RDINT	0.19**	−0.08**	−0.02	0.28**	0.29**	−0.34**	−0.05*	0.01	0.07**	0.02	0.07**	0.12**		−0.08**	−0.01	−0.11**	0.03	0.29**
LEV	−0.02	0.05	−0.09**	−0.01	−0.01	0.06**	−0.11**	0.46**	−0.03	−0.21**	0.28**	0.08**	0.06*		0.02	0.17**	0.26**	−0.08**
OP/TANG	−0.19**	−0.08*	−0.04	−0.15**	−0.06*	0.14**	−0.19**	0.26**	−0.08**	0.16**	0.00	−0.01	0.03	0.12**		0.45**	−0.22**	−0.01
YIELD	−0.01	−0.01	−0.03	−0.04	0.03	−0.01	−0.06*	0.09**	−0.04	0.15**	0.23**	−0.36**	0.12**	−0.13**	0.11**		−0.01	−0.13**
ISSUE/MV	0.03	−0.01	−0.01	0.03	0.03	0.01	−0.05*	0.07*	0.01	−0.07**	0.15**	0.03	0.05	0.25**	−0.05*	−0.09**		−0.10**
GROWTH	−0.05	−0.01	0.00	−0.03	−0.04	−0.01	0.01	−0.03	0.02	0.04*	−0.08**	−0.01	0.01	−0.07**	−0.01	−0.02	−0.07**	

Probabilities reported are: Sig. *, ** =< 0.05 and =<0.01, respectively.
INTANG/TA = intangible assets reported on the balance sheet divided by total assets;
RD/TA = research and development assets divided by total assets;
GW/TA = purchased goodwill divided by total assets; and
IIA/TA = identifiable intangible assets divided by total assets.

Formation costs, deferrals, and issue costs are not included in the intangible asset variables employed in hypothesis tests (see Table 2, Panel B). Deferrals include extractive industry firms' exploration costs and other items not fitting the other categories. All other variables are defined in Table 4. Market value of equity (*MV*) and sales divided by market value of equity (*SLS/MV*) are in natural log form.

TABLE 6

Tobit Regressions of Intangible Assets Divided by Total Assets on Technology and Property Rights Related Variables for the Pooled Data (1993–1997)

$$y_{it} = \Sigma_{y=93}^{97} \beta_{0y}YR_{yit} + \beta_1 STRENGTH_{it} + \beta_2 STRENGTH^2_{it} + \beta_3 CYCLE_{it} + \beta_4 CYCLE^2_{it} + \beta_5 SCIENCE_{it} + \beta_6 SCIENCE^2_{it} + \beta_7 SLS/MV_{it} + \beta_8 LIST_{it} + \beta_9 MV_{it} + \beta_{10} CAP/MV_{it} + \beta_{11} EV/MV_{it} + \beta_{12} RDINT_{it} + \mu_{it} \quad (1)$$

Panel A: Tests of H1–H3

		Technology Conditions		Appropriability Conditions			
	Sign	**H1 Technology Strength**	**H2 Technology Cycle Time**	**H3 Science Linkage**	**H3 Information Environment Innovation and Rent-Seeking**	**Both H1–H3**	**Wald Test F-statistic (H_0: $\beta j = 0$)**
STRENGTH	+	7.3e–05 6.06**				4.9e–05 3.57**	12.77**
STRENGTH²	–	−6.9e–09 −3.52**				−5.0e–09 −2.58**	7.05**
CYCLE	–		−0.057 −7.62**			−0.028 −2.84**	8.90**
CYCLE²	+		0.002 6.34**			0.001 2.56**	7.01**
SCIENCE	+			0.007 1.57		0.007 1.52	2.33
SCIENCE²	–			−0.001 −1.38		−0.000 −0.96	1.02
SLS/MV	+				0.004 2.46**	0.004 2.48**	5.58*
LIST	–				0.001 4.73**	0.001 4.05**	6.04*
MV	+				0.008 2.56**	0.014 4.19**	15.96**
CAP/MV	+				0.015 3.81**	0.022 4.88**	16.97**

(*continued on next page*)

TABLE 6 (Continued)

EV/MV	+				0.047 2.81**	0.037 2.39**	24.39**
RDINT	+				1.431 3.45**	0.283 0.69	0.42
Intercept		0.016 1.05	0.404 8.86**	0.043 2.83**	−2.644 −4.67**	−2.264 −3.89**	
Adj. pseudo R^2		0.07	0.07	−0.01	0.07	0.13	
Log likelihood		−161.28	−158.16	−207.51	−151.75	−107.63	
Akaike info. Criterion		0.247	0.244	0.316	0.239	0.185	
Hannan-Quinn Criterion		0.259	0.256	0.327	0.257	0.211	

Panel B: Omitted Variable Tests for the Technology Condition Quadratic Terms

		Technology Conditions		Appropriability Conditions	Both	Wald Test F-statistic
	Sign	H1	H2	H3	H1–H3	(H_0: $\beta j = 0$)
STRENGTH	+	3.4e–05 7.30**			2.5e-05 4.75**	2.58**
CYCLE	−		−0.011 −5.74**		−0.005 −2.00*	4.01*
SCIENCE	+			0.001 0.63	0.003 1.65	2.72
SLS/MV	+				0.004 2.61**	6.82**
LIST	−				0.001 4.26**	18.15**
MV	+				0.014 4.03**	16.21**
CAP/MV	+				0.023 5.28**	27.89**
EV/MV	+				0.042 2.83**	8.02**

(continued on next page)

TABLE 6 (Continued)

	Sign	Technology Conditions		Appropriability Conditions	Both	Wald Test F-statistic
		H1	H2	H3	H1–H3	(H_0: $\beta j = 0$)
RDINT	+				0.568	1.86
					1.36	
Intercept		0.031	0.163	0.049	−2.463	
		2.16*	6.55**	3.26**	−4.31**	
Adj. pseudo R^2		0.05	0.04	−0.01	0.12	
Log likelihood		−169.81	−186.84	−208.43	−119.18	
Akaike info. Criterion		0.259	0.285	0.315	0.197	
Hannan-Quinn Criterion		0.269	0.295	0.325	0.219	

Omitted Variables Test	F-Statistic Log Likelihood Ratio
STRENGTH^2	17.08**
	12.03**
CYCLE^2	10.20**
	14.29**
SCIENCE^2	−0.18
	0.66

The dependent variable is *INTANG/TA* equal to intangible assets reported on the balance sheet divided by total assets. Table 4 defines the independent variables. Untabulated year dummy variables are included in the pooled regressions.

Left-censored observations = 430–431; Uncensored observations = 930–935. Tobit regression coefficient estimates, Z-statistics, and probabilities are reported (Sig. * = <0.05; ** = <0.01). Z-statistics are computed using Huber (1967) and White (1980, 1982) adjusted standard errors. Maximum likelihood estimates use the Newton-Raphson algorithm.

The Wald statistic tests how close the unrestricted estimates are to satisfying the restrictions under the null hypothesis that the regression coefficient for the variable is zero. The Wald test is based on maximum likelihood estimates of the variance. The Wald statistic is asymptotically distributed as χ^2 and if the errors are assumed to be independent and identically distributed then the Wald divided by the number of restrictions under the null hypothesis gives a finite sample F-statistic. A positive significant F-statistic indicates the null hypothesis of zero for the coefficient is rejected.

Akaike info criterion (AIC) [(−2(Log. L/t) +2(k/t)] and Hannan-Quinn criterion (HQ) [(−2(Log. L/t) + 2kLog(Log(t))/t] are selection criteria for non-nested models where Log. L is the log likelihood function with *k* parameters estimated using *t* observations. The smallest value of the AIC and HQ indicates the preferred model.

The redundant variables test is a test for the statistical significance of a subset of the included variables in the regression. The null hypothesis is tested that a subset of variables has jointly zero coefficients and might thus be deleted from the equation. The F-statistic (the difference between the residual sum of squares for the restricted and unrestricted regressions) and Log Likelihood Ratio ($-2(l_r - l_u)$, where l_r and l_u are the maximized values of the log likelihood functions for the restricted and unrestricted regressions, respectively), are tests of the null hypothesis that the coefficients on the variables are jointly zero.

smallest value indicates the preferred equation, which in Table 6, Panel A is the regression including all the variables (in the "Both" column).

Table 6, Panel B reports the estimates for Equation (1) omitting the quadratic terms (for technology strength, technology cycle time, science linkage). The results are qualitatively the same as those in Panel A. However, the coefficient estimates and the power of the Wald statistics differ. In particular, excluding the quadratic terms causes decreased loading on technology and innovation/rent-seeking variables and increased loading on the listing, market value, and capital commitment variables. The omitted variables tests at the bottom of Panel B are significant for the technology strength and cycle time quadratic terms, suggesting this increased loading is due to omitted, technology variables. Finally, the Akaike and Hannan-Quinn information criterion suggest that the full Equation (1) in Panel A, including the quadratic terms (for the technology variables), is the preferred equation from the estimates reported in Table 6.

Table 7 reports individual year and pooled estimates for Equation (2). Equation (2) includes the predictor variables and the competing variables proxying for cross-sectional differences in contracting, firm performance, and signaling incentives. The pooled estimation includes untabulated fixed-year effects. The signs for the technology strength, technology cycle time and science linkage variables are all consistent with the predicted signs although the significance varies across the years. Contrary to Table 6, Table 7 results provide some evidence consistent with a positive science linkage relationship, but the information environment measure, sales deflated by market value, is now insignificant. The results mirror those in Table 6 for the other information environment (capital commitment, listing year, market value) and innovation/rent-seeking measures (excess valuation, R&D intensity). The positive sign remains for the listing year variable incrementally to market value, the IPO, and secondary issue variables, indicating this variable is capturing younger, established firms. As it is probable these latter firms would be the ones with maturing investment opportunities, the positive sign is consistent with efficient accounting choices.

In relation to the competing explanation variables, there is some evidence consistent with an IPO signaling association with the recording of intangible assets but no evidence of an association with secondary issues of debt and equity. The evidence is consistent with a significant, negative association between operating cash flows divided by tangible assets and recorded intangible assets as predicted. However, the earnings-yield coefficient has a positive sign, not the predicted negative sign. Leverage has the predicted positive sign and is significant in each year. The earnings-yield and leverage results suggest it is not only firms that have yet to grow that are recording intangible assets, but also firms that have already grown.

Redundant variables tests in the last column of Table 7 for each variable in the pooled regression are also consistent with the hypothesized relations between recorded intangible assets and technology and property-rights-related conditions. The F-statistics and Log likelihood ratios suggest that sales deflated by market value, capital commitment, and R&D intensity are the only redundant predictor variables, while the secondary issues variable is the only redundant competing explanation variable. To examine the separate explanatory power of the competing (contracting, operating, and signaling) variables, the pooled regression is re-estimated including only these variables. This regression has an adjusted R^2 of only 3 percent compared to 13 percent for the predictor variable regression (i.e., the "Both" column in Panel A of Table 6). The importance of the predictor variables is further confirmed by Log likelihood ratio and F-statistics reported in Table 7, which robustly reject the null that the set of predictor variables in Equation (6) are redundant.

TABLE 7
Tobit Regressions of Intangible Assets Divided by Total Assets on the Predictor and Competing Explanatory Variables

$$y_{it} = \beta_0 + \beta_1 STRENGTH_{it} + \beta_2 STRENGTH^2_{it} + \beta_3 CYCLE_{it} + \beta_4 CYCLE^2_{it} + \beta_5 SCIENCE_{it} + \beta_6 SCIENCE^2_{it} + \beta_7 SLS/MV_{it} + \beta_8 LIST_{it} + \beta_9 MV_{it} + \beta_{10} CAP/MV_{it} + \beta_{11} EV/MV_{it} + \beta_{12} RDINT_{it} + \Sigma\beta_j COMPETING_{jit} + \mu_{it} \qquad (2)$$

							Pooled 0 = 429; 0 = 924		Redundant Variables Test
	Sign	1993 0 = 70 >0 = 145	1994 0 = 82 >0 = 185	1995 0 = 92 >0 = 194	1996 0 = 90 >0 = 201	1997 0 = 95 >0 = 199	Competing Explanations	All Variables	F-Statistic Log L. Ratio
H1: Technology Strength									
STRENGTH	+	3.9e–05	2.4e–05	1.0e–04	6.9e–05	3.5e–05		5.1e–05	20.47**
		0.58	0.68	2.91**	2.32**	1.04		3.79**	16.11**
STRENGTH^2	–	−1.0e–08	−4.4e–09	−1.8e–08	−7.9e–09	−3.3e–09		−5.6e–09	12.02**
		−0.51	−0.49	−2.50**	−2.30**	−0.85		−2.96**	9.96**
H2: Technology Cycle Time									
CYCLE	–	−0.047	−0.022	−0.041	−0.011	−0.035		−0.024	5.13*
		−1.93*	−1.51	−1.96*	−0.37	−1.67*		−2.46**	8.95**
CYCLE^2	+	0.002	0.001	0.002	0.001	0.001		0.001	3.69*
		1.97*	0.87	1.96*	0.47	1.73*		2.12*	7.77**
H3: Appropriability Conditions—Science Linkage									
SCIENCE	+	0.015	0.045	0.020	0.021	0.020		0.012	3.51
		0.74	2.23**	1.36	1.25	1.50		2.44**	6.96**
SCIENCE^2	–	−0.002	−0.003	−0.001	−0.001	−0.001		−0.001	3.61*
		−0.78	−2.25**	−1.00	−0.91	−1.36		−1.92*	5.07*
H3: Appropriability Conditions—Information Environment									
SLS/MV	+	−0.002	1.3e–04	−0.001	0.003	0.006		0.002	−3.65
		−0.49	0.05	−0.25	0.78	1.70		1.31	2.31
LIST	–	0.002	0.001	0.001	0.001	0.001		0.001	21.95**
		2.38**	2.16*	1.25	1.63	1.25		4.14**	13.04**
MV	+	0.023	0.021	0.009	0.012	0.018		0.017	40.24**
		2.93**	2.87**	1.27	1.45	2.77**		4.95**	31.46**
CAP/MV	+	0.055	0.041	0.009	−0.008	−0.022		0.013	1.68
		3.65**	2.45**	1.31	−0.49	−1.20		2.69**	2.72

(*continued on next page*)

TABLE 7 (Continued)

H3: Appropriability Conditions—Innovation and Rent-Seeking									
EV/MV	+	0.078	0.088	0.096	0.125	0.007		0.050	42.04**
		3.13**	2.49**	3.21**	3.42**	0.64		2.82**	51.18**
RDINT	+	0.502	0.250	0.106	0.117	−0.438		0.136	2.44
		0.42	0.33	0.16	0.17	−0.42		0.34	0.19
Contracting, Operating Performance, and Signaling Incentives									
IPO	+	0.104	0.048	0.108	−0.025	0.349	0.098	0.082	5.12*
		1.76*	0.86	1.38	−0.210	4.02**	2.33**	2.05*	.27*
ISSUE/MV	+	−0.029	−0.007	0.003	−0.005	0.052	−0.003	−0.010	0.68
		−0.80	−0.35	0.12	−0.11	1.62	−0.26	0.34	0.77
OP/TANG	−	−0.112	−0.127	−0.007	−0.202	−0.069	−0.099	−0.104	63.43**
		−3.04**	−0.98	−0.06	−5.69**	−1.36	−2.71**	−3.11**	39.38**
YIELD	−	0.113	−0.012	0.104	0.022	0.043	0.034	0.063	15.56**
		3.74**	−0.17	1.99*	0.95	1.02	2.07*	2.56**	19.93**
LEV	+	0.229	0.238	0.228	0.262	0.170	0.139	0.188	9.02**
		2.61**	3.30**	3.20**	3.44**	2.28*	4.28**	5.32**	31.10**
GROWTH	+	0.009	−0.002	−0.004	−0.006	−0.012	−0.004	−0.003	4.50*
		3.80**	−0.85	−1.48	−3.33**	−4.52**	−3.95**	−3.36**	10.59**
Intercept		−4.107	−2.852	−1.552	−1.941	−1.307	0.073	−2.358	
		−2.43**	−2.24**	−1.18	−1.64	−1.10	2.67**	−4.14**	
Adj. pseudo R^2		0.34	0.13	0.18	0.26	0.24	0.03	0.18	
Log likelihood		5.50	1.97	−10.74	10.66	1.31	−176.88	−64.58	
Redundant							**Predictor**	21.79**	
Variables Test							**variables**	224.59**	
F-Statistic							**Competing**	14.48**	
Log L. Ratio							**variables**	91.23**	

Tobit regression coefficient estimates, Z-statistics, and probabilities are reported (Sig. * = <0.05; ** = <0.01). Z-statistics are computed using Huber (1967) and White (1980, 1982) adjusted standard errors. Maximum likelihood estimates use the Newton-Raphson algorithm. Table 4 defines the independent variables. Untabulated dummy variables controlling for year effects are included in the pooled regressions. The redundant variables test is a test for the statistical significance of a subset of the included variables in the regression. The null hypothesis is tested that a subset of variables in an equation has zero coefficients and might thus be deleted from the equation. The F-statistic (the difference between the residual sum of squares for the restricted and unrestricted regressions) and Log Likelihood Ratio ($-2(l_r - l_u)$ where l_r and l_u are the maximized values of the log likelihood functions for the restricted and unrestricted regressions, respectively), are tests of the null hypothesis that the coefficients on the variables are jointly zero.

To summarize, the primary hypothesis tests suggest that technology and property-rights-related conditions are important explanations for management's accounting choice to record intangible assets. The analysis suggests they are more important explanations than the contracting, operating, and signaling variables.

Robustness Tests

Additional tests evaluate the sensitivity of these results to the distributional properties of the data and complexities of the business environment. These include (a) rank regressions; (b) higher and lower technology industry effects; and (c) industry effects. For (a), the Tobit regressions with ranked transformations of the strength of the technology, cycle time, science linkage, and R&D intensity variables give the same results except that the R&D intensity coefficient is significant with a negative sign. For (b), Equation (2) is re-estimated with technology strength, cycle time, science linkage, and R&D intensity, each entered as two continuous higher and lower technology variables that are the value of the original variable or zero.[22] The results for H1–H3 and the competing explanatory variables are very similar to those already reported indicating that the technology "value added" in an industry is not an omitted, correlated variable. The only new insights are that the predicted negative technology cycle time and positive science linkage effects are more pronounced for firms in industries that have traditionally been classified as lower technology "value added." This result probably reflects a documented trend to employ high-technology equipment and techniques in traditionally low-technology industries (see DIST 1996). In addition, R&D intensity is significant and negative (positive) for companies in lower (higher) technology industries. These findings for science linkage and R&D intensity provide further insights on the mixed results obtained for these variables in the "Primary Hypotheses Results" subsection. Finally, re-estimating Equation (2) with industry dummies does not alter the results indicating they are not driven by industry.[23]

The "Value" of Management Discretion under GAAP to Record Intangible Assets

If underlying economic conditions are a first-order influence on accounting choice for intangible assets, then, *ceteris paribus*, the intangible assets for which management have the highest accounting discretion should be more highly correlated with the underlying economics of the firm. Moreover, this greater alignment with economic factors should also result in higher value relevance to investors for these recorded intangible assets compared to the two other classes. These two predictions are tested to provide additional evidence on the efficiency outcomes of giving management discretion to record intangible assets. Recall that management has a voluntary choice to record identifiable intangible assets. In contrast, it is mandatory to record purchased goodwill arising in an acquisition,[24] while R&D assets can be recorded if management is sure beyond reasonable doubt that the expected benefits will outweigh the costs.

Equation (2) is re-estimated with the three intangible asset classes as the dependent variables: purchased goodwill divided by total assets, R&D assets divided by total assets, and identifiable intangible assets divided by total assets. In addition, returns models are estimated based on the following earnings-based Equation (Ohlson 1995).

---

[22] That is, *Htech_STRENGTH* = *STRENGTH* value if *TECH* = 1, and 0 if *TECH* = 0; and *Ltech_STRENGTH* = *STRENGTH* value if *TECH* = 0, and 0 if *TECH* = 1. Technology use in industry affects the maturity of the industry, value added to products, and profits and risks (Agarwal and Audretsch 2001). The OECD schema is used to classify firms as higher or lower technology (see OECD 1997).

[23] The only industries with significant coefficients are media and publishing with positive signs, and construction, energy, and mining with negative signs.

[24] Of course, management have the strategic choice to obtain intangible assets by acquisition, by internal development, by an alliance, or another method.

$$\begin{aligned} R_{it} = {} & \alpha_0 + \alpha_1 \Delta E_{it} + \alpha_2(\Delta E_{it}{*}E\_neg_{it}) + \alpha_3 E_{it} + \alpha_4(E_{it}{*}E\_neg_{it}) + \alpha_5 Debt_{it} \\ & + \alpha_6 Tang_{it} + \alpha_7 GW_{it} + \alpha_8 RD_{it} + \alpha_9 IIA_{it} + \alpha_{10}(Tang_{it}{*}Bv\_neg_{it}) \\ & + \alpha_{11}(GW_{it}{*}Bv\_neg_{it}) + \alpha_{12}(RD_{it}{*}Bv\_neg_{it}) + \alpha_{13}(IIA_{it}{*}Bv\_neg_{it}) + \alpha_{14} Cap_{it} \\ & + \Sigma_{n=1}^{16}\, \alpha_j Industry_{jit} + \Sigma_{y=93}^{97}\, \alpha_t Year_{it} + \eta_{it} \end{aligned} \tag{3}$$

where:

R_{it} = fiscal year stock return with dividends added back for firm i for time t;
E_{it} = per share earnings before extraordinary items for firm i for time t;
E_neg_{it} = a dummy variable equal to 1 for firms with negative earnings, and 0 otherwise for firm i for time t;
$Debt_{it}$ = total liabilities per share for firm i for time t;
$Tang_{it}$ = tangible assets per share for firm i for time t;
GW_{it} = purchased goodwill assets per share for firm i for time t;
RD_{it} = research and development assets per share for firm i for time t;
IIA_{it} = identifiable intangible assets per share for firm i for time t;
Bv_neg_{it} = a dummy variable equal to 1 for firms with negative equity book value, and 0 otherwise for firm i for time t;
Cap_{it} = the capital commitments disclosed in the notes to the accounts that are not yet recognized on the balance sheet per share for firm i for time t;
$\Sigma\alpha_j Industry_{jit}$ = industry dummy variables;
$\Sigma\alpha_t Year_{it}$ = year dummy variables; and
η_{it} = the regression residual.

The continuous variables in Equation (3) are per share and deflated by lagged price. Equation (3) includes changes in earnings, earnings, and book value of equity components to enable the significance of the coefficients for the intangible asset classes to be evaluated, while controlling for other accounting information sources. Prior evidence shows that the weights relating earnings and book value to price vary predictably with the profitability of current operations (e.g., Barth et al. 1996). Given the diversity of the sample firms (i.e., their size, life cycle stage, and performance), dummy variables are therefore interacted with assets and earnings to permit the slopes to vary for firms with positive and negative values of book value and earnings. In addition, capital expenditures disclosed in the notes to the accounts but not recognized on the balance sheet proxy for unrecorded, inter-temporal options to alter the scale of operations (Zhang 1999).

Evidence consistent with the predictions above requires: (a) for the re-estimated Equation (2), that significance tests of the regression coefficients are consistent with H1–H3 for the identifiable intangible asset regression, but not for the goodwill and R&D asset estimations; and (b) the identifiable intangible assets are more highly correlated with stock returns in estimates of Equation (3) as evidenced by significant t-statistics and Wald tests that suggest α_9 is greater than α_7 and α_8. In relation to (a), estimates of Equation (2) for the three classes of intangible assets are reported in Table 8.

The results are consistent with (a) and hence the prediction that the intangible assets with the highest accounting discretion are more highly correlated with the underlying economics of the firm. In Table 8, the regression estimates are consistent with all three of

TABLE 8
Effects of Differences in Accounting Discretion on the Predicted Relations in H1–H3

Tobit Regressions of Intangible Asset Classes (*GW/TA*, *RD/TA*, *IIA/TA*) on the Predictor and Competing Variables (Pooled 1993–1997)

$$y_{it} = \Sigma_{y93}^{97}\beta_{0y}YR_{yit} + \beta_1 STRENGTH_{it} + \beta_2 STRENGTH^2_{it} + \beta_3 CYCLE_{it} + \beta_4 CYCLE^2_{it} + \beta_5 SCIENCE_{it} + \beta_6 SCIENCE^2_{it} + \beta_7 SLS/MV_{it} + \beta_8 LIST_{it} + \beta_9 MV_{it} - \beta_{10} CAP/MV_{it} + \beta_{11} EV/MV_{it} + \beta_{12} RDINT_{it} + \Sigma\beta_j COMPETING_{jit} + \mu_{it} \quad (2)$$

	Sign	**GW/TA** **0 = 634** **> 0 = 716**		**RD/TA** **0 = 1140** **> 0 = 210**		**IIA/TA** **0 = 697** **> 0 = 653**	
H1: Technology Strength							
STRENGTH	+		−2.5e–05		6.9e–06		7.8e–05
			−2.79**		0.44		4.57**
STRENGTH²	−		3.6e–09		−4.7e–09		−9.2e–09
			3.04**		−2.04*		−3.85**
H2: Technology Cycle Time							
CYCLE	−		−0.024		−0.063		−0.022
			−3.95**		−5.78**		−1.84*
CYCLE²	+		0.001		0.002		0.001
			3.34**		4.38**		1.71*
H3: Appropriability Conditions—Science Linkage							
SCIENCE	+		3.2e–03		−0.011		0.015
			1.36		−1.61*		2.20*
SCIENCE²	−		−2.2e–04		0.001		−0.001
			−1.51		1.79*		−1.67
H3: Appropriability Conditions—Information Environment							
SLS/MV	+		0.010		0.002		−0.001
			5.59**		0.95		−0.35
LIST	−		−2.8e–05		−0.001		0.002
			−0.22		−2.61**		4.21**
MV	+		0.006		−0.019		0.027
			4.04**		−3.22**		6.30**
CAP/MV	+		−0.002		−0.015		1.1e-04
			−0.24		−0.81		0.01
H3: Appropriability Conditions—Innovation and Rent-Seeking							
EV/MV	+		0.007		−0.002		0.036
			1.68*		−0.22		2.19**
RDINT	+		−1.411		−2.086		1.648
			−6.86**		−4.32**		3.54**
Contracting, Operating Performance, and Signaling Incentives							
IPO	+	−0.002	0.013	−0.011	−0.020	0.106	0.083
		−0.08	0.53	−0.207	−0.44	2.05*	1.67
ISSUE/MV	+	−0.009	−0.004	−0.033	−0.021	0.010	0.002
		−1.62	−0.77	−1.23	−1.49	0.56	0.17
OP/TANG	−	−0.008	−0.036	−0.027	0.008	−0.093	−0.096
		−0.32	−1.49	−2.19*	0.41	−2.50*	−2.53**
YIELD	−	0.007	0.021	−0.020	−0.002	−0.006	0.019
		0.76	1.52	−1.33	−0.14	−0.30	0.57
LEV	+	0.091	0.050	−0.020	−0.060	0.066	0.159
		4.92**	2.19**	−0.49	−1.18	1.47	3.30**
GROWTH	+	−0.002	−0.001	0.001	0.002	−0.002	−0.002
		−2.71**	−1.71*	0.85	1.49	−1.78*	−1.58

(*continued on next page*)

TABLE 8 (Continued)

		GW/TA		***RD/TA***		***IIA/TA***	
		0 = 634		**0 = 1140**		**0 = 697**	
	Sign	**> 0 = 716**		**> 0 = 210**		**> 0 = 653**	
Intercept		−0.021	0.114	−0.208	3.179	−0.021	−4.056
		−1.42	0.42	−5.30**	2.96**	−0.59	−4.53**
Adj. pseudo R^2		−0.02	0.06	−0.01	0.04	0.02	0.19
Log likelihood		197.17	294.57	−299.49	−227.30	−509.79	−404.62

Tobit regression coefficient estimates, Z-statistics, and probabilities are reported (Sig. * = <0.05; ** = <0.01). Z-statistics are computed using Huber (1967) and White (1980, 1982) adjusted standard errors. Maximum likelihood estimates use the Newton-Raphson algorithm.
Table 4 defines the independent variables.
The dependent variables are defined as follows:
GW/TA = purchased goodwill divided by total assets;
RD/TA = research and development assets divided by total assets; and
IIA/TA = identifiable intangible assets divided by total assets.
Untabulated dummy variables controlling for year effects are included in the pooled regressions.

the hypotheses only in the identifiable intangible asset regression.[25] The choice to record identifiable intangible assets is positively related to the strength of the technology (H1), science linkage (H3), the state of the firm's information environment (H3) (listing year and market value), and the innovation/rent-seeking activity (H3) (excess valuation and R&D intensity), and is negatively associated with the length of the cycle time (H2). The choice to record identifiable intangible assets is also associated with lower operating performance and higher leverage and is positively associated with the IPO variable. However, the IPO relationship is only observed in the "competing variable" regression (second to last column of Table 8) suggesting "IPO signaling" is a second-order effect to technology and property rights conditions. The competing variable only regression (second to last column) has an R^2 of only 2 percent compared to 20 percent for the full regression including the technology and property-rights-related variables. This suggests the technology and property-rights-related conditions are more important than the contracting and signaling explanations.

The goodwill and R&D asset regressions, in contrast, provide mixed results. The only evidence consistent with the hypothesized relations across all three regressions is the negative relation predicted between the cycle time length and the recording of intangible assets (H2). For the goodwill asset regression, the only other robust correlations are positive associations between the recording of goodwill assets and the sales and market value variables. The correlations with sales and market value are conjectured to be artifacts of the GAAP requirement to capitalize purchased goodwill and the acquiring firm's capacity to fund the acquisitions, rather than a reflection of the firm's underlying economics. This conjecture is consistent with the limited statistical association between the goodwill assets and stock returns reported (ahead) in Table 9. The R&D asset regression (in Table 8) indicates that R&D assets tend to be recorded by smaller established companies (smaller market value and older as measured by the listing year), not yet generating sales, facing short cycle times, and in low R&D intensity industries. It is doubtful these R&D assets are the "beyond reasonable doubt" type of R&D envisaged by accounting regulators since

---

[25] The identifiable intangible assets regression has a higher (pseudo) R^2 compared to the R^2s for the goodwill and R&D regressions (17 percent compared to 6 and 4 percent, respectively). However, likelihoods and the R^2 statistics are not comparable when the dependent variables differ (e.g., Edwards 1972).

TABLE 9
Stock Market Valuation Differences across Intangible Asset Classes

Ordinary least squares regressions of stock returns on earnings changes, earnings, debt, tangible, and intangible asset classes, negative earnings and equity book value dummy variable interactions, and capital commitments, for the pooled sample 1993–1997.

$$R_{it} = \alpha_0 + \alpha_1 \Delta E_{it} + \alpha_2(\Delta E_{it}{*}E\_neg_{it}) + \alpha_3 E_{it} + \alpha_4(E_{it}{*}E\_neg_{it}) + \alpha_5 Debt_{it} + \alpha_6 Tang_{it} + \alpha_7 GW_{it} + \alpha_8 RD_{it} + \alpha_9 IIA_{it} + \alpha_{10}(Tang_{it}{*}Bv\_neg_{it}) + \alpha_{11}(GW_{it}{*}Bv\_neg_{it}) + \alpha_{12}(RD_{it}{*}Bv\_neg_{it}) + \alpha_{13}(IIA_{it}{*}Bv\_neg_{it}) + \alpha_{14} Cap_{it} + \Sigma_{n=1}^{16}\alpha_j Industry_{jit} + \Sigma_{y=93}^{97}\alpha_t Year_{it} + \eta_{it} \quad (3)$$

		Dependent Variable R_{it}							
	Sign	**Continuous variables are per share and deflated by lagged stock price, P_{it-1}**							
ΔE_{it}	+	0.075 0.81	0.007 0.10	0.193 4.90**	−0.004 −0.05	0.193 4.88**	−0.001 −0.01	0.189 5.16**	−0.002 −0.03
$\Delta E_{it}{*}E\_neg_{it}$	−		0.006 0.06**	−0.415 −3.39**	0.075 0.59	−0.407 −3.22**	0.083 0.62	−0.402 −3.18**	0.089 0.70
E_{it}	+		0.489 2.75**		0.503 2.87**		0.496 2.75**		0.492 2.65**
$E_{it}{*}E\_neg_{it}$	−		−0.866 −3.56**		−0.956 −3.77**		−0.954 −3.64**		−0.962 −3.70**
$Debt_{it}$	−	−0.230 −1.50	−0.447 −3.32**	−0.368 −3.27**	−0.473 −3.56**	−0.365 −3.16**	−0.472 −3.47**	−0.376 −3.23**	−0.488 −3.63**
$Tang_{it}$	+	0.274 2.43**	0.412 4.14**	0.346 3.94**	0.405 4.13**	0.332 3.69**	0.392 3.93**	0.348 3.78**	0.409 4.10**
GW_{it}	+	0.164 0.86	0.190 0.92	0.962 1.70*	1.039 1.87*	0.846 1.85*	0.924 2.07*	0.922 2.18*	0.999 2.42**
RD_{it}	+	0.497 1.43	0.607 1.75	0.455 1.31	0.498 1.48	0.539 1.58	0.581 1.74	0.456 1.33	0.499 1.49
IIA_{it}	+	0.183 2.43**	0.224 3.04**	0.226 3.96**	0.211 3.20**	0.224 3.95**	0.210 3.19**	0.199 3.38**	0.192 2.80**
$Tang_{it}{*}Bv\_neg_{it}$	+/−			0.022 0.46	−0.006 −0.12	0.025 0.50	−0.003 −0.06	0.026 0.53	0.002 0.05
$GW_{it}{*}Bv\_neg_{it}$	+/−			−0.873 −1.52	−1.006 −1.80	−0.761 −1.63*	−0.897 −1.98*	−0.841 −1.94*	−0.983 −2.35*

(continued on next page)

TABLE 9 (Continued)

$RD_{it}*Bv\_neg_{it}$	+/−	2.556 1.18	3.067 1.28	2.765 1.21	3.279 1.30	2.404 0.94	3.109 1.12
$IIA_{it}*Bv\_neg_{it}$	+/−	0.367 1.23	0.447 1.33	0.347 1.08	0.425 1.17	0.326 0.95	0.392 1.03
Cap_{it}	+			0.149 2.11*	0.149 2.16*	0.181 2.37**	0.179 2.41**
$Biotechnology_{it}$	+/−					0.573 3.44**	0.517 3.24**
$Chemicals_{it}$	+/−					0.385 3.39**	0.375 3.38**
$Construction_{it}$	+/−					0.361 2.33*	0.413 2.66**
$Diversified_{it}$	+/−					0.655 2.47**	0.655 2.44**
$Energy\ and\ Mining_{it}$	+/−					0.602 3.74**	0.609 3.82**
$Engineering_{it}$	+/−					0.203 1.65	0.164 1.30
$Leisure,\ Retail\ and\ Wholesale_{it}$	+/−					0.074 0.37	0.102 0.54
$Manufacture_{it}$	+/−					0.276 2.85**	0.279 2.86**
$Material\ Science_{it}$	+/−					0.284 1.73	0.225 1.43
$Media_{it}$	+/−					0.442 3.69**	0.424 3.37**
$Pharmaceutical_{it}$	+/−					0.269 2.02*	0.274 2.05*
$Service_{it}$	+/−					0.528** 0.81	0.505** 3.87**
$Software_{it}$	+/−					0.432 1.35	0.425 1.34

(continued on next page)

	Sign	**Dependent Variable R_{it} Continuous variables are per share and deflated by lagged stock price, $P_{i,t-1}$**							
Technology$_{it}$	+/−							0.440 3.42**	0.456 3.56**
Telecommunication$_{it}$	+/−							0.381 2.34*	0.370 2.30*
Transport$_{it}$	+/−							0.179 1.24	0.210 1.46
α_0		0.454 3.92**	0.124 1.86	0.383 3.66**	0.318 2.95**	0.372 3.53**	0.307 2.84**	−0.040 −0.29	−0.098 −0.69
Adj. R^2		0.15	0.17	0.18	0.20	0.19	0.21	0.20	0.22
F-statistic		22.48 0.00	23.08 0.00	19.39 0.00	19.52 0.00	19.35 0.00	19.52 0.00	10.01 0.00	10.64 0.00
Wald test statistic H_0: $\alpha_7 = 0$ (*GW*) $\alpha_8 = 0$ (*RD*) $\alpha_9 = 0$ (*IIA*)		$\alpha_7 = 0$ 2.04 (0.15) $\alpha_8 = 0$ 5.88 (0.02) $\alpha_9 = 0$ 7.23 (0.01)	$\alpha_7 = 0$ 0.86 (0.36) $\alpha_8 = 0$ 3.06 (0.08) $\alpha_9 = 0$ 9.24 (0.00)	$\alpha_7 = 0$ 2.88 (0.09) $\alpha_8 = 0$ 1.72 (0.19) $\alpha_9 = 0$ 15.65 (0.00)	$\alpha_7 = 0$ 3.50 (0.06) $\alpha_8 = 0$ 2.18 (0.14) $\alpha_9 = 0$ 10.23 (0.00)	$\alpha_7 = 0$ 3.42 (0.06) $\alpha_8 = 0$ 2.48 (0.12) $\alpha_9 = 0$ 15.59 (0.00)	$\alpha_7 = 0$ 4.26 (0.04) $\alpha_8 = 0$ 3.03 (0.08) $\alpha_9 = 0$ 10.16 (0.00)	$\alpha_7 = 0$ 4.76 (0.03) $\alpha_8 = 0$ 1.77 (0.18) $\alpha_9 = 0$ 11.40 (0.00)	$\alpha_7 = 0$ 5.88 (0.02) $\alpha_8 = 0$ 2.23 (0.14) $\alpha_9 = 0$ 7.83 (0.00)

Parameter estimates are from pooled ordinary least squares regressions (n = 1,267), t-statistics and probabilities are reported (Sig. * = <0.05; ** = <0.01). t-statistics are computed from White (1980) adjusted standard errors. All continuous variables are per share and deflated by lagged stock price. Untabulated year dummy variables are included in the estimation.

The Wald test statistics are based on maximum likelihood estimates. The Wald test evaluates how close the unrestricted estimates are to satisfying the restrictions under the null hypothesis that the regression coefficient for the variable is zero. A positive significant F-statistic indicates the null hypothesis of zero for the coefficient is rejected.

R_{it} = stock return for firm *i* for time *t* with dividends added back;
E_{it} = earnings before extraordinary items for firm *i* for time *t*;
E_neg_{it} = a dummy variable equal to 1 for firms with negative earnings and 0 otherwise for firm i for time t;
$Debt_{it}$ = total liabilities for firm *i* for time *t*;
$Tang_{it}$ = tangible assets for firm *i* for time *t*;
GW_{it} = purchased goodwill assets for firm *i* for time *t*;
RD_{it} = research and development assets for firm *i* for time *t*;
IIA_{it} = identifiable intangible assets for firm *i* for time *t*;
Bv_neg_{it} = a dummy variable equal to 1 for firms with negative equity book value and 0 otherwise for firm *i* for time *t*;
Cap_{it} = (unrecognized on the balance sheet) capital commitments disclosed in the notes to the accounts for firm *i* for time *t*; and
$\eta_{i,t}$ = the regression residual.

these are, on average, smaller, earlier life cycle companies facing escalating costs of competing in shorter cycle technologies. This conjecture is consistent with the results (ahead) in Table 9 where the R&D asset coefficient is never significant.

The variables in Table 9 generally have the expected signs. However, the coefficient estimate for the R&D assets is never significant, while the significance of the goodwill coefficient is sensitive to the specification of the equation. In contrast, the coefficient estimates for identifiable intangible assets are positive and significant in all the regressions in Table 9. Wald statistics (based on maximum likelihood estimates) reported in the bottom row of Table 9 confirm these results: the null hypothesis, $\alpha_9 = 0$, is rejected at less than 1 percent, but overall the Wald tests cannot convincingly reject the null that $\alpha_7 = \alpha_8 = 0$ for the majority of the regressions. Finally, including industry dummy variables does not alter the main thrust of these conclusions.

To summarize, the "value of management discretion" tests suggest that identifiable intangible assets are more highly correlated with the underlying economics of the firm compared to the less discretionary classes, purchased goodwill and R&D assets. The former type of intangible asset is also consistently value-relevant in contrast to the more limited relevance of the other two classes. Together these findings are consistent with the prediction that a greater alignment of identifiable intangible assets with the firm's underlying economics results in higher value relevance to investors compared to the other two classes of intangible assets.

VI. CONCLUSIONS

On January 9, 2002, the FASB added the project *Disclosure of Information about Intangible Assets Not Recognized in Financial Statements* to its technical agenda. In addition, the International Accounting Standards Board notes there is the perception that the guidance in IAS No. 38, *Intangible Assets*, is not sufficiently robust.[26] Progress on these issues has been hampered by a gap in the accounting choice literature on the determinants of the choice to record intangible assets. We know that contracting, regulation, and signaling can influence the accounting choice in some contexts. However, the important question bearing on these issues, and largely unaddressed, is the extent that management makes choices to record intangible assets based on their insights into the underlying economics of their firm. This paper contributes to the accounting choice literature by tackling this question in a unique setting in which management has discretion to record intangible assets.

The results suggest that efficiency motivations are important in management's choice. Recorded intangible assets are associated with the strength and cycle time attributes of the technology impacting the firm's operations and with the property-rights-related factors that affect the firm's ability to predict and appropriate the investment benefits. These effects are more important than other contracting and signaling factors, consistent with the underlying economics operating as a first-order effect as envisaged by GAAP. Additional evidence provides insights that suggest there is "value" in giving management accounting discretion to record intangible assets. This evidence indicates that the intangible assets for which management has the highest accounting discretion, identifiable intangible assets, are more highly correlated with the underlying economics of the firm compared to the two less discretionary classes, purchased goodwill and R&D. The usefulness of this accounting discretion is reflected in the value-relevance of the identifiable intangible assets class to investors compared to the limited relevance of the other two classes. This evidence suggests limiting management's choices to record intangible assets would tend to reduce, rather than improve, the quality of the balance sheet and investor's information set.

---

[26] http://www.iasplus.com/resource/ias0107.pdf.

Evidence on the extent that accounting discretion leads to recorded intangible assets that are aligned with the firms' underlying economics is an important contribution to the literature, to policy makers, and to users of accounting information. There is concern that the demand for greater accounting discretion will lead to widespread manipulation of the balance sheet and earnings. The results in this paper suggest these concerns are overstated.

APPENDIX

Coding the Sample Firms with the Technology Database Metrics

The firms were first classified into their CHI industry (one of 26) and then into their technology area (one of 30). In most cases, it was clear which industry and technology the company is aligned with because the CHI industry and technology classifications are industrial in orientation. Once the nature of the business and the product lines are known, the classification is usually obvious. In the case of diversified companies, the highest sales segment, from the business segment data in the annual report, was nominated as dominant. If the sample company has patents, then these will already have an IPC assigned by the patent examiner. For these companies, it was a matter of consulting the CHI database/IPC concordance to find the CHI technology area into which the companies' patents fall.

After initial pilot coding of a small sample in consultation with academics from various disciplines (e.g., scientists to explain "semiconductors"), the author classified the sample companies into a CHI industry and dominant technology. To evaluate the replicability of this task, a recently graduated student with a Bachelor's degree in Accounting independently classified the sample firms. The student produced substantially the same results. Where there were differences, the available choices had similarly sized metrics so the (uncorrected) effect on the analysis would not have been material. For example (as shown below), a company classified into the "Biotechnology" industry and "Pharmaceuticals" technology, and vice versa, would have roughly the same metrics. Similarly, for a company classified into the "Electronics" industry and "Semiconductors and Electronics" technology and vice versa. The classification can thus be replicated.

Year Ending	Industry	Technology Area	Current Impact Index	Tech. Strength	Tech. Cycle Time	Science Linkage
1993	Biotechnology	08 – Pharmaceuticals	0.7	24.4	6.2	8.9
1994	Biotechnology	08 – Pharmaceuticals	1.1	35.8	5.8	5.6
1995	Biotechnology	08 – Pharmaceuticals	1.2	63.7	7.4	18.7
1996	Biotechnology	08 – Pharmaceuticals	1.3	105.3	8.5	19.8
1997	Biotechnology	08 – Pharmaceuticals	1.6	311.6	8.6	26.4
	Average 1993–1997		**1.2**	**108.2**	**7.3**	**15.9**
1993	Pharmaceuticals	09 – Biotechnology	0.8	189.8	7.5	11.9
1994	Pharmaceuticals	09 – Biotechnology	0.7	140.3	7.2	10.5
1995	Pharmaceuticals	09 – Biotechnology	0.6	141.5	7.9	12.8
1996	Pharmaceuticals	09 – Biotechnology	0.5	184.6	7.9	19.5
1997	Pharmaceuticals	09 – Biotechnology	0.8	391.1	8.4	23.8
	Average 1993–1997		**0.7**	**209.5**	**7.8**	**15.7**
1993	Electronics	23 – Semiconductors and Electronics	1.2	1526.9	5.7	0.8
1994	Electronics	23 – Semiconductors and Electronics	1.2	1530.9	5.8	0.8

Year Ending	Industry	Technology Area	Current Impact Index	Tech. Strength	Tech. Cycle Time	Science Linkage
1995	Electronics	23 – Semiconductors and Electronics	1.2	1617.7	5.7	1.0
1996	Electronics	23 – Semiconductors and Electronics	1.1	1321.6	6.0	1.1
1997	Electronics	23 – Semiconductors and Electronics	1.2	1516.7	6.5	0.9
	Average 1993–1997		**1.2**	**1502.8**	**5.9**	**0.9**
1993	Semiconductors	23 – Semiconductors and Electronics	1.9	1003.9	5.3	1.0
1994	Semiconductors	23 – Semiconductors and Electronics	1.8	1246.2	5.4	0.9
1995	Semiconductors	23 – Semiconductors and Electronics	2.0	1623.8	5.3	1.2
1996	Semiconductors	23 – Semiconductors and Electronics	1.8	1716.6	5.5	1.4
1997	Semiconductors	23 – Semiconductors and Electronics	2.1	2637.3	5.6	1.2
	Average 1993–1997		**1.9**	**1645.6**	**5.4**	**1.1**

REFERENCES

Aboody, D., and B. Lev. 1998. The value relevance of intangibles: The case of software capitalization. *Journal of Accounting Research* 36: 161–191.

Agarwal, R., and D. B. Audretsch. 2001. Does entry size matter? The impact of the life cycle and technology on firm survival. *Journal of Industrial Economics* 49 (1): 21–43.

Anderson, D., and I. Zimmer. 1992. Reactions to regulation of accounting for goodwill. *Accounting and Finance* (November): 27–50.

Audretsch, D. 1995. *Innovation and Industry Evolution.* Cambridge, MA: Massachusetts Institute of Technology.

Ball, R. J. 1980. Discussion of accounting for research and development costs: The impact on research and development expenditures. *Journal of Accounting Research* 18: 27–37.

Banker, R., and S. Datar. 1989. Sensitivity, precision and linear aggregation of signals for performance evaluation. *Journal of Accounting Research* 27: 21–39.

Barth, M., W. H. Beaver, and W. R. Landsman. 1996. Value-relevance of banks' fair value disclosures under SFAS No. 107. *The Accounting Review* 71 (4): 513–537.

Boldrin, M., and D. K. Levine. 2004. Rent-seeking and innovation. *Journal of Monetary Economics* 51: 127–160.

Boone, J. P., and K. K. Raman. 2003. Does discretion increase signaling or opportunistic behavior? Evidence from impairment losses in the extractive petroleum industry. Working paper, Mississippi State University and University of North Texas.

Chia, F. L. M. 1995. An investigation of the causes and effects of assets write-offs in Australia. Working paper, University of Western Australia.

Christie, A. A., and J. L. Zimmerman. 1994. Efficient and opportunistic choices of accounting procedures: Corporate control contests. *The Accounting Review* 69 (4): 539–567.

Cohen, R. B., C. Polk, and T. Vuolteenaho. 2001. The value spread. NBER Working Paper No. 10131. Cambridge, MA: NBER.

Connolly, R. A., B. T. Hirsch, and M. Hirschey. 1986. Union rent-seeking, intangible capital, and market value of the firm. *Review of Economics and Statistics* 68 (4): 567–577.

DeAngelo, H., L. DeAngelo, and D. Skinner. 1994. Accounting choice in troubled companies. *Journal of Accounting and Economics* 17: 113–143.

Dechow, P. M., M. R. Huson, and R. G. Sloan. 1994. The effect of restructuring charges on executives' cash compensation. *The Accounting Review* 69 (January): 138–156.

———, R. G. Sloan, and A. P. Sweeney. 1996. Causes and consequences of earnings manipulation: An analysis of firms subject to enforcement actions by the SEC. *Contemporary Accounting Research* 13 (1): 1–36.

Department of Industry, Science and Technology (DIST). 1996. *Australian Business Innovation—A Strategic Analysis.* Measures of Science and Innovation 5. Canberra, Australia: Australian Government Publishing Service.

Dosi, G. 1988. Sources, procedures and microeconomic effects of innovation. *Journal of Economic Literature* 36: 1126–1171.

Eberly, J. C. 1997. International evidence on investment and fundamentals. *European Economic Review* 41: 1055–1078.

Edwards, A. W. F. 1972. *Likelihood.* Cambridge, U.K.: Cambridge University Press.

Fields, T., T. Lys, and L. Vincent. 2001. Empirical research on accounting choice. *Journal of Accounting and Economics* 31 (1–3): 255–307.

Geroski, P. A. 1995. Markets for technology: Knowledge, innovation and appropriability. In *Handbook of the Economics of Innovation and Technological Change,* edited by P. Stoneman, Chapter 4, 90–131. Oxford, U.K.: Blackwell Publishers Ltd.

———. 2000. Models of technology diffusion. *Research Policy* 29: 603–625.

Graves, S. B. 1989. Why costs increase when projects accelerate. *Research Technology Management* 32 (2): 16–18.

Greene, W. H. 2000. *Econometric Analysis.* 3rd edition. Englewood Cliffs, NJ: Prentice Hall.

Grenadier, S. R., and A. M. Weiss. 1997. Investment in technological innovations: An option pricing approach. *Journal of Financial Economics* 44: 397–416.

Healy, P., S. Myers, and C. Howe. 2002. R&D accounting and the tradeoff between relevance and objectivity. *Journal of Accounting Research* 40 (3): 677–710.

Huber, P. J. 1967. The behavior of maximum likelihood estimates under non-standard conditions. In *Proceedings of the Fifth Berkeley Symposium Mathematical Statistics 1,* 221–233. Berkeley, CA: University of California Press.

Hughes, P. 1986. Signaling by direct disclosure under asymmetric information. *Journal of Accounting and Economics* 8: 119–142.

Ittner, C. D., and D. F. Larcker. 1997. Product development cycle time and organizational performance. *Journal of Marketing Research* XXXIV: 13–23.

———, ———, and M. V. Rajan. 1997. The choice of performance measures in annual bonus contracts. *The Accounting Review* 72 (2): 231–255.

Kasznik, R. 1997. Financial reporting discretion and corporate voluntary disclosure: Evidence from the software industry. Working paper, Stanford University.

Knight, F. 1921. *Risk, Uncertainty, and Profit.* Chicago, IL: University of Chicago Press.

Lambert, R. A., and D. F. Larcker. 1987. An analysis of the use of accounting and market measures of performance in executive compensation contracts. *Journal of Accounting Research* 25 (Supplement): 85–125.

Leland, H., and D. Pyle. 1977. Information asymmetries, financial structure, and financial intermediation. *Journal of Finance* 32: 371–387.

Lindahl, F. W. 1989. Dynamic analysis of inventory accounting choice. *Journal of Accounting Research* 27 (2): 201–226.

Marshall, A. 1920. *Principles of Economics.* Eighth edition, Reset 1949. London, U.K.: Macmillan

McNichols, M., and P. C. O'Brien. 1997. Self-selection and analyst coverage. *Journal of Accounting Research* 35 (Supplement): 167–199.

Metcalfe, J. S. 1995. The economic foundations of technology policy. In *Handbook of the Economics of Innovation and Technological Change,* edited by P. Stoneman, Chapter 11, 409–512. Oxford, U.K.: Blackwell Publishers Ltd.

———. 1998. *Evolutionary Economics and Creative Destruction.* London, U.K.: Routledge.

Muller, K. 1999. An examination of the voluntary recognition of acquired brand names in the United Kingdom. *Journal of Accounting and Economics* 26: 179–191.

Narin, F. 1995. Patents as indicators for the evaluation of industrial research output. *Scientometrics* 34 (3): 489–496.

Natarajan, R. 1996. Stewardship value of earnings components: Additional evidence on the determinants of executive compensation. *The Accounting Review* 71: 1–22.

Nelson, R. R. 1987. *Understanding Technical Change as an Evolutionary Process.* Amsterdam, The Netherlands: North Holland.

Ohlson, J. 1995. Earnings, book values and dividends in security valuation. *Contemporary Accounting Research* 11 (Spring): 661–668.

Organization of Economic Co-Operation and Development (OECD). 1994. Using patent data as science and technology indicators. *Patent Manual.* Cedex, Paris: OECD.

———. 1997. Revision of the high-technology sector and product classification. STI Working Papers. Cedex, Paris: OECD.

Penrose, E. T. 1959. *The Theory of the Growth of the Firm.* Oxford, U.K.: Basil Blackwell.

Percy, M. 1998. Financial reporting discretion and voluntary disclosure: Corporate research and development expenditure in Australia. Ph.D. dissertation, The University of Queensland.

Polanyi, M. 1967. *The Tacit Dimension.* New York, NY: Doubleday Anchor.

Richardson, S. 2001. Discretionary disclosure: A note. *Abacus* 37 (2): 233–247.

Rosenberg, N. 1994. *Exploring the Black Box: Technology, Economics and History.* Cambridge, U.K. and New York, NY: Cambridge University Press.

———. 1998. Uncertainty and technological change. In *The Economic Impact of Knowledge*, edited by D. Neef, G. Anthony Siesfeld, and J. Cefola. St. Louis, MO: Butterworth-Heinemann.

Scherer, F. M. 1966. Time-cost tradeoffs in uncertain empirical research projects. *Naval Research Logistics Quarterly* 13 (2): 71–82.

Schumpeter, J. 1934. *The Theory of Economic Development.* Reprint: Cambridge, MA: Harvard University Press. First published [in German] 1912. New York, NY: Oxford University Press.

Sloan, R. G. 1993. Accounting earnings and top executive compensation. *Journal of Accounting and Economics* 16: 55–100.

Smith, W., Jr., and R. Watts. 1992. The investment opportunity set and corporate financing, dividend, and compensation policies. *Journal of Financial Economics* 32: 263–292.

Thomadakis, S. B. 1977. A value-based test of profitability and market structure. *Review of Economics and Statistics* (May): 179–185.

Usher, A. P. 1954. *A History of Mechanical Inventions.* 2nd edition. Cambridge, MA: Harvard University Press.

Webster, E. 1999. *The Economics of Intangible Investment.* Cheltenham, U.K.: Edward Elgar Publishing.

White, H. 1980. A heteroscedasticity-consistent covariance matrix estimator and a direct test for heteroscedasticity. *Econometrica* 48: 817–838.

———. 1982. Maximum likelihood estimation of mis-specified models. *Econometrica* 53: 1–16.

Whittred, G., and I. Zimmer. 1994. Contracting cost determinants of GAAP for joint ventures in an unregulated environment. *Journal of Accounting and Economics* 17: 95–111.

Zhang, G. 1999. Accounting information, capital investment decisions, and equity valuation: Theory and empirical implications. Working paper, Hong Kong University of Science and Technology.

Editorial Data

The following table contains information about turnaround time for manuscripts (including revisions) on which editorial decisions were made in the 12-month period ended February 28, 2005. Turnaround time is the number of days between the date that the manuscript was received *and the date of the editor's letter to the author(s)*:

	Number of Manuscripts	Percent	Cumulative Number	Cumulative Percent
0 ≤ Days ≤ 30	100	21.19	100	21.19
31 ≤ Days ≤ 60	174	36.86	274	58.05
61 ≤ Days ≤ 90	137	29.03	411	87.08
91 ≤ Days ≤ 120	52	11.02	463	98.09
121 ≤ Days	9	1.90	472	100.00
Total	472	100.00		

The mean review time was 55.16 days; the median review time was 55 days.

New Submissions by calendar year (January 1 to December 31)

1992	241
1993	234
1994	231
1995	195
1996	230
1997	195
1998	196
1999	239
2000	260
2001	260*
2002	324
2003	327
2004	307
2005 (Feb 28)	62 (2 months)

* 2001—in addition to the 260 regular submissions, 68 MSs were submitted to the *TAR* Quality of Earnings Conference.

The **acceptance rate** (defined as number of MSs accepted divided by the number of new submissions) over the past 5 years is between 12–16% per year.

EDITORIAL POLICY AND STYLE INFORMATION

EDITORIAL POLICY

According to the policies set by the Publications Committee (which were endorsed by the Executive Committee and were published in the *Accounting Education News*, June 1987), *The Accounting Review* "should be viewed as the premier journal for publishing articles reporting the results of accounting research and explaining and illustrating related research methodology. The scope of acceptable articles should embrace any research methodology and any accounting-related subject, as long as the articles meet the standards established for publication in the journal ... No special sections should be necessary. The primary, but not exclusive, audience should be—as it is now—academicians, graduate students, and others interested in accounting research."

The primary criterion for publication in *The Accounting Review* is the significance of the contribution an article makes to the literature.

The efficiency and effectiveness of the editorial review process is critically dependent upon the actions of both authors submitting papers and the reviewers. Authors accept the responsibility of preparing research papers at a level suitable for evaluation by independent reviewers. Such preparation, therefore, should include subjecting the manuscript to critique by colleagues and others and revising it accordingly prior to submission. The review process is not to be used as a means of obtaining feedback at early stages of developing the research.

Reviewers and associate editors are responsible for providing critically constructive and prompt evaluations of submitted research papers based on the significance of their contribution and on the rigor of analysis and presentation. Associate editors also make editorial recommendations to the editor.

MANUSCRIPT PREPARATION AND STYLE

The Accounting Review's manuscript preparation guidelines follow (with a slight modification) the B-format of *The Chicago Manual of Style* (15th ed.; University of Chicago Press). Another helpful guide to usage and style is *The Elements of Style*, by William Strunk, Jr., and E. B. White (Macmillan). Spelling follows *Webster's Collegiate Dictionary.*

FORMAT

1. All manuscripts should be typed in 12-point font on one side of 8½ × 11" good quality paper and be double-spaced, except for indented quotations.
2. Manuscripts should be as concise as the subject and research method permit, generally not to exceed 7,000 words.
3. Margins of at least one inch from top, bottom, and sides should facilitate editing and duplication.
4. To promote anonymous review, authors should not identify themselves directly or indirectly in their papers or in experimental test instruments included with the submission. Single authors should not use the editorial "we."
5. A cover page should show the title of the paper, the author's name, title and affiliation, email address, any acknowledgments, and a footnote indicating whether the author would be willing to share the data (see last paragraph in this statement).

Pagination: All pages, including tables, appendices and references, should be serially numbered. Major sections should be numbered in Roman numerals. Subsections should not be numbered.

Numbers: Spell out numbers from one to ten, except when used in tables and lists, and when used with mathematical, statistical, scientific, or technical units and quantities, such as distances, weights and measures. For example: *three days; 3 kilometers; 30 years*. All other numbers are expressed numerically.

Percentages and Decimal Fractions: In nontechnical copy use the word percent in the text.

Hyphens: Use a hyphen to join unit modifiers or to clarify usage. For example: *a well-presented analysis; re-form*. See *Webster's* for correct usage.

Keywords: The abstract is to be followed by four keywords that will assist in indexing the paper.

ABSTRACT/INTRODUCTION

An Abstract of about 100 words should be presented on a separate page immediately preceding the text. The Abstract should concisely inform the reader of the manuscript's topic, its methods, and its findings. Keywords and the Data Availability statements should follow the Abstract. The text of the paper should start with a section labeled "I. Introduction," which provides more details about the paper's purpose, motivation, methodology, and findings. Both the Abstract and the Introduction should be relatively nontechnical, yet clear enough for an informed reader to understand the manuscript's contribution. The manuscript's title, but neither the author's name nor other identification designations, should appear on the Abstract page.

TABLES AND FIGURES

The author should note the following general requirements:

1. Each table and figure (graphic) should appear on a separate page and should be placed at the end of the text. Each should bear an Arabic number and a complete title indicating the exact contents of the table or figure. Tables and figures should define each variable. The titles and definitions should be sufficiently detailed to enable the reader to interpret the tables and figures without reference to the text.
2. A reference to each graphic should be made in the text.
3. The author should indicate by marginal notation where each graphic should be inserted in the text.
4. Graphics should be reasonably interpreted without reference to the text.
5. Source lines and notes should be included as necessary.

Equations: Equations should be numbered in parentheses flush with the right-hand margin.

DOCUMENTATION

Citations: Work cited should use the "author-date system" keyed to a list of works in the reference list (see below). Authors should make an effort to include the relevant page numbers in the cited works.

1. In the text, works are cited as follows: authors' last name and date, without comma, in parentheses: for example, (Jones 1987); with two authors: (Jones and Freeman 1973); with more than two: (Jones et al. 1985); with more than one source cited together (Jones 1987; Freeman 1986); with two or more works by one author: (Jones 1985, 1987).
2. Unless confusion would result, do not use "p." or "pp." before page numbers: for example, (Jones 1987, 115).
3. When the reference list contains more than one work of an author published in the same year, the suffix a, b, etc. follows the date in the text citation: for example, (Jones 1987a) or (Jones 1987a; Freeman 1985b).
4. If an author's name is mentioned in the text, it need not be repeated in the citation; for example, "Jones (1987, 115) says ..."
5. Citations to institutional works should use acronyms or short titles where practicable; for example, (AAA ASOBAT 1966); (AICPA Cohen Commission Report 1977). Where brief, the full title of an institutional work might be shown in a citation: for example, (ICAEW *The Corporate Report* 1975).
6. If the manuscript refers to statutes, legal treatises or court cases, citations acceptable in law reviews should be used.

Reference List: Every manuscript must include a list of references containing only those works cited. Each entry should contain all data necessary for unambiguous identification. With the author-date system, use the following format recommended by *The Chicago Manual*:

1. Arrange citations in alphabetical order according to surname of the first author or the name of the institution responsible for the citation.
2. Use author's initials instead of proper names.
3. Date of publication should be placed immediately after author's name.
4. Titles of journals should not be abbreviated.
5. Multiple works by the same author(s) in the same year are distinguished by letters after the date.
6. Inclusive page numbers are treated as recommended in *Chicago Manual* section 6.83.

Sample entries are as follows:

American Accounting Association, Committee on Concepts and Standards for External Financial Reports. 1977. *Statement on Accounting Theory and Theory Acceptance*. Sarasota, FL: AAA.

Demski, J. S., and D. E. M. Sappington. 1989. Hierarchical structure and responsibility accounting. *Journal of Accounting Research* 27 (Spring): 40–58.

Dye, R., B. Balachandran, and R. Magee. 1989. Contingent fees for audit firms. Working paper, Northwestern University, Evanston, IL.

Fabozzi, F., and I. Pollack, eds. 1987. *The Handbook of Fixed Income Securities.* 2nd edition. Homewood, IL: Dow Jones-Irwin.

Kahneman, D., P. Slovic, and A. Tversky, eds. 1982. *Judgment Under Uncertainty: Heuristics and Biases.* Cambridge, U.K.: Cambridge University Press.

Porcano, T. M. 1984a. Distributive justice and tax policy. *The Accounting Review* 59 (October): 619–636.

———. 1984b. The perceived effects of tax policy on corporate investment intentions. *The Journal of the American Taxation Association* 6 (Fall): 7–19.

Shaw, W. H. 1985. Empirical evidence on the market impact of the safe harbor leasing law. Ph.D. dissertation, The University of Texas at Austin.

Sherman, T. M., ed. 1984. *Conceptual Framework for Financial Accounting.* Cambridge, MA: Harvard Business School.

Footnotes: Footnotes are not used for documentation. Textual footnotes should be used only for extensions and useful excursions of information that if included in the body of the text might disrupt its continuity. Footnotes should be consecutively numbered throughout the manuscript with superscript Arabic numerals. Footnote text should be doubled-spaced and placed at the end of the article.

SUBMISSION OF MANUSCRIPTS

Authors should note the following guidelines for submitting manuscripts:

1. Manuscripts currently under consideration by another journal or publisher should not be submitted. The author must state that the work is not submitted or published elsewhere.
2. In the case of manuscripts reporting on field surveys or experiments, four copies of the instrument (questionnaire, case, interview plan, or the like) should be submitted. Information that might identify the author(s) must be deleted from the instrument.
3. MS should be submitted via email as Microsoft® Word or PDF files to the *TAR* office at TARUAZ@email.arizona.edu. A submission letter, a separate cover page, and the MS containing no author identification should be emailed as separate files. The submission fee should be paid online (VISA or MasterCard only) at: https://aaahq.org/AAAforms/journals/tarsubmit.cfm. If unable to pay online, a check in U.S. funds, made payable to the American Accounting Association, may be sent to Professor Dan Dhaliwal, Senior Editor, *The Accounting Review*, The University of Arizona, Department of Accounting, McClelland Hall 301, 1130 E. Helen Street, Tucson, AZ 85721-0108. The submission fee in U.S. funds is $125.00 for members and $200.00 for nonmembers of the AAA. Effective January 1990, the submission fee is nonrefundable.
4. The author should retain a copy of the paper.
5. Revisions must be submitted within 12 months from request, otherwise they will be considered new submissions.

COMMENTS

Comments on articles previously published in *The Accounting Review* will be reviewed (anonymously) by two reviewers in sequence. The first reviewer will be the author of the original article being subjected to critique. If substance permits, a suitably revised comment will be sent to a second reviewer to determine its publishability in *The Accounting Review*. If a comment is accepted for publication, the original author will be invited to reply. All other editorial requirements, as enumerated above, also apply to proposed comments.

POLICY ON REPRODUCTION

An objective of *The Accounting Review* is to promote the wide dissemination of the results of systematic scholarly inquiries into the broad field of accounting.

Permission is hereby granted to reproduce any of the contents of the *Review* for use in courses of instruction, as long as the source and American Accounting Association copyright are indicated in any such reproductions.

Written application must be made to the American Accounting Association, 5717 Bessie Drive, Sarasota, FL 34233-2399, for permission to reproduce any of the contents of the *Review* for use in other than courses of instruction—e.g., inclusion in books of readings or in any other publications intended for general distribution. In consideration for the grant of permission by the *Review* in such instances, the applicant must notify the author(s) in writing of the intended use to be made of each reproduction. Normally, the *Review* will not assess a charge for the waiver of copyright.

Except where otherwise noted in articles, the copyright interest has been transferred to the American Accounting Association. Where the author(s) has (have) not transferred the copyright to the Association, applicants must seek permission to reproduce (for all purposes) directly from the author(s).

POLICY ON DATA AVAILABILITY

The following policy has been adopted by the Executive Committee in its April 1989 meeting. "An objective of (*The Accounting Review, Accounting Horizons, Issues in Accounting Education*) is to provide the widest possible dissemination of knowledge based on systematic scholarly inquiries into accounting as a field of professional research, and educational activity. As part of this process, authors are encouraged to make their data available for use by others in extending or replicating results reported in their articles. Authors of articles which report data dependent results should footnote the status of data availability and, when pertinent, this should be accompanied by information on how the data may be obtained."

JULY 2005 PLACEMENT ADS

*The deadline for information to be included in the "Placement Information" section is two months prior to the date of publication. The **Review** is published in January, April, July, and October. Placement advertising and replies should be sent to the American Accounting Association, 5717 Bessie Drive, Sarasota, FL 34233-2399, ATTENTION: ADVERTISING DEPT. All replies to box numbers should be on separate sheets to facilitate forwarding.*

301 PURDUE UNIVERSITY CALUMET (PUC) invites applications for a tenure-track Assistant Professor Accounting position effective Fall 2005. A Ph.D. in Accounting or ABD is preferred, but consideration will also be given those possessing a business-related terminal degree and a CPA and experience teaching upper-level Accounting courses. Requirements include good communication skills, oral and written, a record of outstanding teaching or potential for same, and a record or potential for research and grant writing. The School of Management offers Bachelor's and Master's degrees in Accounting. The campus is located in Hammond, Indiana just southeast of Chicago. PUC offers attractive salary and fringe benefits. The position will be open until filled. Submit letter of application and five copies of your *curriculum vitae* with references to Professor Philip H. Empey, School of Management, Purdue University Calumet, Hammond, IN 46323; or email empey@calumet.purdue.edu. Purdue University Calumet is an Equal Access/Equal Opportunity/Affirmative Action Employer.

302 UNIVERSITY OF NOTRE DAME, Department of Accountancy, invites applications for position openings at the Assistant and Associate Professor levels. All research areas will be considered. Applicants for Assistant Professor positions should expect to complete doctoral degree requirements before the start of the contract period. All candidates should have a strong commitment to scholarly research and excellence in teaching. Salary is very competitive and research support is excellent. Please send *curriculum vitae* and an example of scholarly work to Professor Thomas Schaefer, Chair, Department of Accountancy, Room 102D, Mendoza College of Business Administration, University of Notre Dame, Notre Dame, IN 46556-5646. The University of Notre Dame is an Equal Opportunity, Affirmative Action Employer.

303 TEXAS STATE UNIVERSITY, Department of Accounting, invites applications for two tenure-track Assistant/Associate positions beginning Fall 2005. Candidates must have, or anticipate receiving by the end of May 2006, a Ph.D./D.B.A. in Accounting from an accredited university and be "academically qualified" under AACSB standards. However, a Ph.D./D.B.A. in MIS can substitute for AIS applicants. Candidates must be able to teach in two or more of the following areas: Audit, Accounting Ethics, Accounting Information Systems, Taxation, and Financial Accounting. Please send your letter of application, resume, and the names of three references to Dr. Daniel Flaherty, Search Committee Chair, Department of Accounting, Texas State University, 601 University Drive, San Marcos, TX 78666, or email df14@business.swt.edu. Texas State University is an Equal Opportunity Employer. Women, minorities, and individuals with disabilities are encouraged to apply. This position is subject to availability of funding.

304 UNIVERSITY OF ARKANSAS AT LITTLE ROCK invites applications for a tenure-track Assistant or Associate Professor position for Fall 2005. Candidates must have an earned doctorate from an AACSB-accredited university, a CPA certificate, and primary teaching interest in the area of Financial Accounting with secondary interest in Managerial Accounting. Expectations/Responsibilities include excellence in teaching, advising students, active involvement in scholarship and research, and participation in professional organizations. UALR is a metropolitan university offering day, night, and distance classes to accommodate the needs of a diverse student population. The College of Business is located in the new state-of-the-art Donald W. Reynolds Business Center for Business and Economic Development. Submit credentials to Dr. Judyth Swingen, Associate Dean for Graduate Studies, College of Business, University of Arkansas at Little Rock, 2801 South University Avenue, Little Rock, AR 72204; Email: jaswingen@ualr.edu. Include names of at least three references and their contact information.

305 UNIVERSITY OF NORTH TEXAS invites applications for a tenure-track position in Taxation at any academic rank, starting Fall 2005. Candidates must possess an earned doctorate with emphasis in Accounting, and should have teaching experience as well as research accomplishments commensurate with rank. Appropriate certification is desirable. Applications will be considered until the position is filled. Candidates should submit a letter of application, *curriculum vitae,* and the names, addresses, and telephone numbers of four references to Chair, Department of Accounting Search Committee, University of North Texas, PO Box 305219, Denton, TX 76203-5219. Contact Professor Mary Curtis at Email: curtism@unt.edu; Phone: (940) 565-4366 for further information. The University of North Texas, located in the Dallas-Fort Worth Metroplex, is a metropolitan research university with an enrollment in excess of 30,000 students. Accounting programs are offered at the undergraduate, master's, and doctoral levels. For more information, please visit http://www.coba.unt.edu/acct/. The University of North Texas is an Equal Opportunity Employer. Women and minorities are encouraged to apply.

306 MISSISSIPPI STATE UNIVERSITY, College of Business and Industry, School of Accountancy, invites applications for an Assistant or Associate Professor of Accounting, a tenure-track position beginning Fall 2005. Responsibilities include teaching undergraduate and graduate courses in Taxation. Doctorate degree in Accounting is required. ABDs with dissertation near completion may be considered at Instructor level. The position requires excellence in teaching based on prior experience as a Graduate Teaching Assistant or as an Instructor or Assistant Professor, ability to do research leading to publication in nationally refereed journals, and an interest and willingness to be involved in professional Accounting activities. An interest in advising and mentoring students is expected, including participation in the Ph.D. program. Professional certification and professional accounting experience are highly desirable. Salary is competitive. Send letter of application, current *curriculum vitae,* and names and contact information of three references to Director, School of Accountancy, Drawer EF, Mississippi State, MS 39762. MSU is an AA/EOE.

307 UNIVERSITY OF CINCINNATI, Department of Accountancy, invites applications for tenure-track positions in Accounting beginning Fall 2005. The rank is open and preference will be given to Financial/Capital markets. The positions will be open until filled. Minimum qualifications: Ph.D. in Accounting by the start of the appointment. Candidates must have a commitment to excellence in research, teaching, and professional service. The College of Business is AACSB-accredited at the B.B.A. and M.B.A. degree levels and offers a Ph.D. program. In addition to a B.B.A. in Accounting, M.S. degrees in Accounting and Taxation are offered. The University has a strong commitment to the principle of diversity and seeks a broad spectrum of candidates. Submit your letter of application, *curriculum vitae,* teaching evaluations, three letters of reference for Assistant Professors, and a working paper and/or defended dissertation proposal to Professor J. Timothy Sale, Department of Accountancy, PO Box 210211, University of Cincinnati, Cincinnati, OH 45221-0211. The University of Cincinnati is an Affirmative Action/Equal Opportunity Employer.

308 MICHIGAN TECHNOLOGICAL UNIVERSITY invites applicants in all areas of Accounting to apply for tenure-track positions in Accounting beginning Fall 2006. We also invite applications for visiting professors and instructors. A Ph.D. (or ABD near completion) in Accounting from an AACSB-accredited school is required for tenure-track positions. Rank and competitive salary will be commensurate with qualifications and experience. Professional certification and experience are a plus. MTU is committed to excellence in teaching, research, and service. Michigan Tech is a nationally recognized technological university located in Michigan's beautiful Upper Peninsula. Please forward a letter of application, *curriculum vitae,* and a list of three references to Dr. Keith Lantz, Dean, School of Business and Economics, Michigan Technological University, 1400 Townsend Drive, Houghton, MI 49931. Additional information can be obtained by calling the Dean's office at (906) 487-3555. Representatives will be at the Annual Meeting in San Francisco. Application review will begin in September and continue until positions are filled.

309 TEXAS A&M UNIVERSITY–CORPUS CHRISTI, College of Business, invites applications for a tenure-track appointment in Accounting at the Assistant or Associate rank. An earned doctorate in Accounting is required, along with a record of scholarly Accounting Research or demonstrated potential for peer-reviewed publications. Certification and professional experience in Accounting are preferred. All areas will be considered with preference given to Systems, Auditing, or Financial, consistent with the needs of the department. Appointment is for Fall 2005. Salary is competitive. Applicant review will continue until position is filled. Send applications with a list of three references to Dr. Moustafa Abdelsamad, Dean; College of Business; Texas A&M University–Corpus Christi; 6300 Ocean Drive; Corpus Christi, Texas 78412. College of Business undergraduate and graduate business programs are accredited by AACSB International. Texas A&M University–Corpus Christi is an Equal Opportunity, Affirmative Action Employer.

310 POSITION DESIRED: I am an African American woman, with a doctorate, seeking a tenure-track position that would begin Fall 2005 in a school in New York City and its environs. I have several years of teaching experience in Financial Accounting, Microeconomics, Macroeconomics, History of Economic Thought, and have three published works. Contact Aida_Sy@baruch.cuny.edu.

311 WASHINGTON STATE UNIVERSITY, Tri-Cities, Department of Accounting, invites applications for one or more tenure-track positions for Spring or Fall 2006 at the Assistant Professor level. This position requires a doctorate or ABD in Accounting from a nationally recognized program, a record of published research or research potential, and evidence of teaching effectiveness. Preference will be given to applicants with professional certifications, related work experience, and teaching interests in Financial, Managerial, and/or Auditing and Accounting Systems. Submit application (available at: http://www.hrs.wsu.edu/employment/FAPvacancies.asp?id=1219) to Washington State University, Tri-Cities, Dr. John Thornton, 2710 University Drive, Richland, WA 99352; Email: jthornt@tricity.wsu.edu. Your application must be submitted by August 1, 2005 to receive full consideration. WSU employs only U.S. citizens and lawfully authorized non-U.S. citizens. All new employees must show employment eligibility verification as required by the U.S. Immigration and Naturalization Service. WSU is an EEO/AA Employer. Protected group members encouraged to apply.

312 SAINT LOUIS UNIVERSITY, a Catholic Jesuit institution dedicated to education, research, and healthcare, invites applications for a tenure-track position in Accounting at the senior Assistant/Associate/Professor level beginning Fall 2006 (earlier start dates may be considered). Duties include: commitment to teaching excellence; quality research and publication; service to the department and university. All areas of Accounting except Auditing will be considered. A Ph.D. in Accounting is required. Department representatives will attend the AAA Annual Meeting in San Francisco. Candidates are strongly encouraged to schedule an interview by contacting Dr. Ananth Seetharaman, Department of Accounting, Saint Louis University, 3674 Lindell Blvd., St. Louis, MO 63108; Phone (314) 977-3828; Fax (314) 977-1473; Email: acas@slu.edu. The position is subject to budget approval. Saint Louis University is an Affirmative Action, Equal Opportunity Employer and encourages nominations and applications of women and minorities.

313 UNIVERSITY OF SOUTH ALABAMA, Mitchell College of Business, Department of Accounting, invites applications to fill a tenure-track position at the Assistant or Associate Professor level for Fall 2006. Applicants must possess a Ph.D. (or D.B.A.) with a concentration in Accounting or be near completion of the dissertation. The Department of Accounting seeks faculty with a strong commitment to teaching excellence balanced with an active interest in research and publication. The Mitchell College of Business is accredited by the AACSB International. Applications will be accepted until October 1, 2005. Send letter of application, *curriculum vitae*, official transcripts of all academic work, and three letters of reference to Frank R. Urbancic, Department of Accounting, Mitchell College of Business, University of South Alabama, Mobile, AL 36688. The University of South Alabama is an EEO/AA/Title IX/Section 504/ADA/ADEA Employer.

314 SEOUL NATIONAL UNIVERSITY, College of Business Administration, invites applications for a nontenured Accounting faculty position at all levels starting Fall 2005. All areas of Accounting will be considered. The contract is for one year and renewable. The successful candidate is expected to teach two courses each semester at graduate and/or undergraduate levels. The position is likely best suited for a faculty member who plans to take a sabbatical leave from his/her institution and wishes to gain insights on Korean business practices and academic environments. A faculty apartment with nominal rent will be available on the campus. Please send letter of application, current *curriculum vitae,* and three references to Professor Tae-Sik Ahn, Associate Dean for Academic Affairs, College of Business Administration, Seoul National University, Kwanak-ku, Seoul, Korea 151-742; Phone: (82-2) 880-6901; Email: ahnts@snu.ac.kr. Please visit http://cba.snu.ac.kr for more information on College of Business Administration, Seoul National University.

315 KOREA UNIVERSITY BUSINESS SCHOOL (KUBS), the first and best business school in Korea, plans to invite chaired and tenure-track faculty members to apply for positions available at the School's area of Accounting. Remunerations may vary according to qualifications of the applicants. The approximate levels of the yearly payment are as follows: Chaired Professor: from U.S.$100,000; Tenure-track Professor: Assistant Professor: from U.S.$70,000 to U.S.$80,000; Associate Professor: from U.S.$80,000 to U.S.$90,000; Full-time Professor: from U.S.$90,000. In addition, the School will pay research allowance and provide round-trip airfare, and on-campus residence. For further information on the School and Korea University in general, please visit the following websites: KUBS: http://biz2.korea.ac.kr and Korea University: http://www.korea.ac.kr. If you are interested in these invitations, please send your biodata, research list, and confidential letters of reference to Professor Gil S. BAE, the KUBS Chair of the Accounting area; Email: gilbae@korea.ac.kr.

316 MORGAN STATE UNIVERSITY, the Graves School of Business and Management, invites applications for a tenure-track position at the Associate Professor or Assistant Professor rank starting August 2006. Candidates should have a Ph.D. degree in Accounting from an AACSB-accredited institution, and research and teaching interests in Financial Accounting or Managerial Accounting. Candidates for Associate Professor should have a significant record of publications in recognized Accounting journals. Salaries are AACSB-competitive. The University has Business School and Accounting accreditation by the AACSB. The Business School offers a B.S. degree in Accounting and a Ph.D. degree in Business Administration/Accounting. Master's level Accounting courses are offered in the general M.B.A. program. Interested candidates should send letter of interest and academic *curriculum vitae* to Alex P. Tang, Chair, Recruiting Committee, Department of Accounting & Finance, Morgan State University, Baltimore, MD 21251; or email same to atang@moac.morgan.edu. We will interview at the 2005 AAA Annual Meeting. Morgan State University is an Affirmative Action-Equal Opportunity Employer.

317 FAIRFIELD UNIVERSITY, the Charles F. Dolan School of Business (AACSB-International-accredited), invites applications for a tenure-track position, Assistant/Associate Professor of Accounting/Taxation, starting Fall 2006. The candidate must be a CPA, with either a Ph.D./D.B.A. in Accounting with a Master's level degree in Taxation, or a J.D. with LL.M. in Taxation. The successful candidate must also demonstrate a strong commitment to teaching and research. A letter of application, *curriculum vitae,* transcripts, and names and contact information for three references should be submitted, in writing or electronically, to Dr. Roselie McDevitt, Chair, Accounting Department, Charles F. Dolan School of Business, Fairfield University, Fairfield, CT 06824-5195; Email: rmcdevitt@mail.fairfield.edu. Fairfield University, a comprehensive Jesuit University, is committed to intellectual rigor, active service to others, and a humane and nurturing approach to education, openly welcoming students and faculty of all beliefs and backgrounds. Fairfield University is an Affirmative Action/Equal Opportunity Employer.

318 FAIRFIELD UNIVERSITY, the Charles F. Dolan School of Business (AACSB-International-accredited), invites applications for a *Visitor* position, Assistant/Associate Professor of Accounting/Taxation, for the academic year 2005–2006. The candidate must be a CPA, with either a Ph.D./D.B.A. in Accounting with a Master's level degree in Taxation, or a J.D. with LL.M. in Taxation. The successful candidate must also demonstrate a strong commitment to teaching and research. A letter of application, *curriculum vitae,* transcripts, and names and contact information for three references should be submitted, in writing or electronically, to Dr. Roselie McDevitt, Chair, Accounting Department, Charles F. Dolan School of Business, Fairfield University, Fairfield, CT 06824-5195; Email: rmcdevitt@mail.fairfield.edu. Fairfield University, a comprehensive Jesuit University, is committed to intellectual rigor, active service to others, and a humane and nurturing approach to education, openly welcoming students and faculty of all beliefs and backgrounds. Fairfield University is an Affirmative Action/Equal Opportunity Employer.

319 UNIVERSITY OF VERMONT, School of Business Administration, invites applications for a tenure-track position in Accounting beginning Fall 2006. All ranks will be considered. Applicants should have earned a doctorate by the start of the contract period. All areas of Accounting will be considered, but preference will be given to candidates with teaching interests in Auditing and/or Systems. Candidates should have a strong commitment to excellence in teaching and scholarly research. Salary and benefits are AACSB-competitive. Members of the search committee will be attending the 2005 AAA Annual Meeting in San Francisco. Applicants should send a letter of application, current *curriculum vitae*, evidence of teaching effectiveness, and the names of three references to Professor Stephen J. Dempsey, School of Business Administration, 55 Colchester Avenue, Burlington, VT 05405; Email: Stephen.Dempsey@uvm.edu or apply online at: https://www.uvmjobs.com. Applications will be accepted until October 1, 2005; however, we strongly encourage the submission of materials by July 31. The University of Vermont is an Affirmative Action, Equal Opportunity Employer. Applications from women and minorities are actively encouraged to apply.

320 MARQUETTE UNIVERSITY invites applications for two tenure-track positions, one in Financial Accounting and one in any area except Tax, beginning Fall 2006. Applicants should hold a doctoral degree or be in the final stages of dissertation. The first position will be filled at the rank of Assistant Professor and primary teaching responsibility will be in Financial Accounting at the undergraduate and graduate levels. The second position will be filled at either the rank of Assistant or Associate Professor with primary teaching responsibility at the undergraduate and graduate levels. The normal teaching load is 15 semester hours per year. Salary and research support are competitive. The department has 11 full-time faculty. Marquette offers AACSB-accredited undergraduate and graduate degrees in Accounting and Business. Please send *curriculum vitae* and inquiries to Michael D. Akers, Professor and Chair, Department of Accounting, PO Box 1881, College of Business Administration, Marquette University, Milwaukee, WI 53201-1881; Email: Michael.Akers@Marquette.edu. Marquette University is an Affirmative Action/Equal Opportunity Employer.

321 AMERICAN UNIVERSITY, Kogod School of Business, Department of Accounting & Taxation, invites applications for a one-year, non-tenure-track faculty position beginning Fall 2005. This position entails both teaching and service activities. Responsibilities include undergraduate and graduate teaching and service. Depending on staffing needs, the position is potentially renewable. Candidates should have a graduate business degree, a record of high-quality teaching, and an ability to teach Financial and Managerial Accounting courses. Previous business or professional Accounting experience and CPA credential is desired. Review of applications will begin immediately and continue until the position is filled. Please send letter of application, resume, three letters of recommendation and copies of all teaching evaluations to Professor Donald Williamson, Kogod School of Business, American University, Washington, D.C. 20016-8044; Phone: (202) 885-1942; Email: dwillia@american.edu. For further information about the Kogod School of Business, please visit: http://www.kogod.american.edu/. American University is an Equal Opportunity, Affirmative Action Employer. Women and minorities are strongly encouraged to apply.

322 NORTHERN STATE UNIVERSITY invites applications for a tenure-track position in Accounting. The position requires a Ph.D./DBA in Accounting; A.B.D.s within a year of completion will be considered. Rank and salary are dependent on degree status, teaching experience, and research experience. The successful candidate will be able to teach undergraduate Taxation and other undergraduate Accounting courses, and be familiar with Accounting software. Certification as a Certified Public Accountant is desirable. The position is available August 15, 2005. Consideration of applications will begin immediately and continue until the position is filled. For more information, please visit http://www.northern.edu. Click on "Faculty & Staff," then "Human Resources." AA/EOE.

323 FLORIDA INTERNATIONAL UNIVERSITY, College of Business Administration, School of Accounting, invites applications for three tenure-track positions beginning Fall 2006 or earlier. Appointments at the Assistant and Associate Professor ranks will be considered in Financial Accounting, Taxation, or AIS. Search will be open until positions are filled. Ph.D. or equivalent is required. Professional certification is desirable. Demonstrated ability to conduct research publishable in leading academic journals is required. For the Associate level, a distinguished record of scholarship evidenced by publications in top academic journals and an active continuing research agenda is required. Demonstrated excellence in teaching is expected. FIU is a Carnegie Doctoral Research-Extensive (Research-I) institution with more than 32,000 students. The School of Accounting is separately accredited by AACSB. Positions are contingent on final approval. Submit *curriculum vitae* to Dana A. Forgione, Director, School of Accounting, Florida International University, University Park, Miami, FL 33199; Phone: (305) 348-2861. FIU is an Equal Opportunity/Equal Access/Affirmative Action Employer.

324 UNIVERSITY OF LOUISVILLE, College of Business and Public Administration, School of Accountancy, invites applications for a full-time, tenure-track position at the level of Associate Professor to begin in August 2006. Senior Assistant and Associate Professors are welcome to apply. Preference will be given to candidates with professional designation(s) and experience in assurance services. The successful candidate will have a terminal degree and strong accomplishment in both scholarly research and teaching. While the Search Committee will accept applications until a new faculty member is selected, interested individuals are encouraged to submit their letter of interest, *curriculum vitae,* three recommendation letters, and examples of scholarly work prior to August 1 for optimal consideration. Contact: Dr. Betty C. Brown, Chair Accountancy Search Committee, University of Louisville, Louisville, KY 40292; Email: betty.brown@louisville.edu; Phone: (502) 852-5847; Fax: (502) 852-6072. The University of Louisville is an Equal Opportunity/Affirmative Action Employer.

325 UNIVERSITY OF NEVADA, Reno, Department of Accounting and Information Systems, is seeking candidates for a full-time, tenure-track, Assistant Professor in Accounting. Duties include: teaching courses in the areas of Corporate and Partnership Taxation; making intellectual contributions; and participating in service activities within the department and academic and professional communities. Teaching responsibilities apply to both the undergraduate and graduate (master's degree) levels. For complete position description and requirements, contact Search Chair/Coordinator, Dr. John Mills by email at mills@unr.nevada.edu, or in writing, Department of ACC/IS, Mailstop 026, University of Nevada, Reno, Reno, NV 89557, or visit: http://jobs.unr.edu. Dr. Mills will be attending the AAA Annual Meeting in San Francisco 2005. All interested candidates are encouraged to schedule a meeting to learn more about the Tax Accounting position at the University of Nevada, Reno. Closing date is September 15, 2005. EEO/AA women and underrepresented groups are encouraged to apply.

326 UNIVERSITY OF NEVADA, Reno, Department of Accounting and Information Systems, is seeking candidates for a full-time, Assistant, Associate, or Full Professor in Financial Accounting. Duties include: teaching courses in the areas of Intermediate, Advanced, or Graduate Financial Accounting; making intellectual contributions; and participating in service activities within the department and academic and professional communities. Teaching responsibilities apply to both the undergraduate and graduate (master's degree) levels. For complete position description and requirements, contact Search Chair/Coordinator, Dr. John Mills by email at mills@unr.nevada.edu, or in writing at Department of ACC & IS, Mailstop 026, University of Nevada, Reno, NV 89557, or visit http://jobs.unr.edu. Dr. Mills will be attending the AAA Annual Meeting in San Francisco, August 8–11, 2005. All interested candidates are encouraged to schedule a meeting to learn more about the Financial Accounting position at the University of Nevada, Reno. Closing date is September 15, 2005. EEO/AA. Women and underrepresented groups are encouraged to apply.

327 LOUISIANA TECH UNIVERSITY, School of Professional Accountancy, seeks applications for an Assistant or Associate Professor. Appointment is for Fall 2005, but will consider applicants for Fall 2006. Accounting doctorate is required, as is demonstrated ability for high-quality scholarship; certification is preferred. Requires teaching at the upper-division and graduate levels, publishing discipline-based research, and involvement with the Accounting doctoral program. Interest in Financial Accounting or Auditing is preferred. Applicant review will continue until position(s) filled. Located 65 miles east of Shreveport and 30 miles west of Monroe, enrollment totals approximately 12,000 students. Please send applications or letters of inquiry to Thomas J. Phillips, Jr., Director; School of Professional Accountancy; PO Box 10318; Louisiana Tech University; Ruston, LA 71272; Phone: (318) 257-2822; Fax: (318) 257-4253; Email: phillips@cab.latech.edu. Louisiana Tech University is a member of the University of Louisiana System. For additional information, please visit: http://www.cab.latech.edu/public/index.htm. EEO/AA/ADA. Women and minorities are encouraged to apply.

328 ILLINOIS STATE UNIVERSITY, Normal, Department of Accounting, invites applications for Chairperson, Department of Accounting. Required qualifications include an earned doctorate in Accounting or Business Information Systems (with a strong background in Accounting), eligibility for tenure and appointment at the Associate Professor rank or higher, and familiarity with AACSB accreditation standards and processes. The department maintains a B.S in Accountancy, a B.S. in Business Information Systems (pending approval), an M.S. in Accountancy program, and a five-year Bachelor's/Master's of Professional Accountancy program. The College of Business and the Department of Accounting are accredited by AACSB International. Anticipated start date is July 1, 2006. To assure full consideration, send letter of application, three references and full *curriculum vitae* by October 1, 2005 to Dr. Charles McGuire, Department Chair, Finance, Insurance, and Law, College of Business, Illinois State University, Campus Box 5480, Normal, Illinois 61790-5480; Email: crmcgui@ilstu.edu; Telephone: (309) 438-8777. For additional information please visit: http://www.cob.ilstu.edu/accounting. Representatives will be available at the AAA Annual Meeting in San Francisco. Illinois State University is an Equal Opportunity/Affirmative Action University encouraging diversity.

329 OAKLAND UNIVERSITY, Rochester, MI, invites applications for an Assistant Professor of Accounting. Preference is for someone interested in teaching Managerial and Cost Accounting. Qualified candidates must: (1) have earned a Ph.D. in Accounting by August 2006; (2) exhibit an ability to teach at the undergraduate and graduate levels; and (3) conduct scholarly research leading to publication in quality academic journals. The normal teaching load is five classes per academic year. Research activity is supported and expected. A research grant is guaranteed for Summer 2007; salary is market-competitive with excellent fringe. Oakland University is a state-supported institution that enrolls over 16,000 students. It is located 25 miles north of downtown Detroit in Rochester, Michigan. For more information about Oakland University, please visit http://www.oakland.edu. The School of Business Administration is AACSB-accredited. It enrolls 2,000 undergraduate and 550 graduate students. The Accounting program is AACSB-accredited at both the undergraduate and master's levels. If interested, please email your *curriculum vitae* to Professor Edward J. Farragher, Farraghe@oakland.edu. Oakland University is an Affirmative Action/Equal Opportunity Employer and encourages applications from women and minorities.

330 MURRAY STATE UNIVERSITY, College of Business and Public Affairs, invites applicants for an anticipated tenure-track position in Accounting at the Assistant Professor rank for August 2006. Qualifications include a doctoral degree in accounting from an AACSB-accredited university with a residence requirement. Degree completion is expected by the start of the contract period. Professional certification and recent professional experience are desirable. Demonstrated effectiveness in classroom teaching, ability to produce quality research, and a commitment to service are required. Candidates with ability and competency in teaching Auditing are especially encouraged to apply, although other fields of expertise will be considered. Responsibilities will include teaching Accounting courses at the undergraduate and graduate levels, engaging in research resulting in publications in recognized refereed journals, and providing university and regional service. Deadline for applications is September 30, 2005. Interested candidates should send a letter of application, *curriculum vitae,* graduate transcripts, evidence of teaching effectiveness, and three current letters of recommendation to Chair of Accounting Search Committee, Department of Accounting, Murray State University, 351 Business Building, Murray, KY 42071-3342. Murray State University is an Equal Education and Employment Opportunity, M/F/D, AA Employer.

THE ACCOUNTING REVIEW
ISSN 0001-4826

PERIODICALS POSTAGE PAID
SARASOTA FLORIDA
AND ADDITIONAL MAILING OFFICES

POSTMASTER
Send Address Changes To:

AMERICAN ACCOUNTING ASSOCIATION
5717 BESSIE DRIVE
SARASOTA, FL 34233

34314 1 REVIEW
CAL UNIV-135 (2005)
INTERNATIONAL BOOK HOUSE PVT LTD
1 KYD STREET
KOLKATA 700 016
INDIA

THE ACCOUNTING REVIEW

P-140

VOLUME 80, No. 4 OCTOBER 2005

ROBERT M. BOWEN, ANGELA K. DAVIS, and DAWN A. MATSUMOTO
Emphasis on Pro Forma versus GAAP Earnings in Quarterly Press Releases: Determinants, SEC Intervention, and Market Reactions

ANTONIO DAVILA and GEORGE FOSTER
Management Accounting Systems Adoption Decisions: Evidence and Performance Implications from Early-Stage/Startup Companies

SUNIL DUTTA and STEFAN REICHELSTEIN
Stock Price, Earnings, and Book Value in Managerial Performance Measures

RALF EWERT and ALFRED WAGENHOFER
Economic Effects of Tightening Accounting Standards to Restrict Earnings Management

JERE R. FRANCIS, INDER K. KHURANA, and RAYNOLDE PEREIRA
Disclosure Incentives and Effects on Cost of Capital around the World

RANJANI KRISHNAN, JOAN L. LUFT, and MICHAEL D. SHIELDS
Effects of Accounting-Method Choices on Subjective Performance-Measure Weighting Decisions: Experimental Evidence on Precision and Error Covariance

BRIAN MITTENDORF and YUN ZHANG
The Role of Biased Earnings Guidance in Creating a Healthy Tension between Managers and Analysts

EMAD MOHD
Accounting for Software Development Costs and Information Asymmetry

JONATHAN L. ROGERS and PHILLIP C. STOCKEN
Credibility of Management Forecasts

Cuel

22/12/06

A QUARTERLY JOURNAL OF THE
AMERICAN ACCOUNTING ASSOCIATIO

AMERICAN ACCOUNTING ASSOCIATION

The members of the 2005–2006 Executive Committee of the Association are as follows:

President	Judy D. Rayburn, University of Minnesota
President-Elect	Shyam Sunder, Yale University
Vice President	James E. Hunton, Bentley College
Vice President–Education	Nancy A. Bagranoff, Old Dominion University
Vice President–Finance	Susan F. Haka, Michigan State University
Vice President–International	Alfred Wagenhofer, Universitat Graz
Vice President–Professional Relations	D. Scott Showalter, KPMG
Vice President–Publications	Morton P. Pincus, University of California, Irvine
Vice President–Research	John C. Fellingham, The Ohio State University
Vice President–Sections and Regions	Susan V. Crosson, Santa Fe Community College
Past President	Jane F. Mutchler, Georgia State University

The American Accounting Association was founded in 1916 as the American Association of University Instructors in Accounting. Its present name was adopted in 1936. The Association is a voluntary organization of persons interested in accounting education, research, and practice. Full membership entitles one to receive *Accounting Education News*, a selection of one, two, or all three of the Association-wide journals (*The Accounting Review, Accounting Horizons,* and *Issues in Accounting Education*) and the opportunity to purchase Association publications at a discount.

Membership in the Association is available at the following annual rates:

Full membership:
The membership dues are based on the selection of one, two, or all three of the following Association-wide journals: *The Accounting Review, Accounting Horizons,* and *Issues in Accounting Education.*
(This does not include Section journals.)

Select one Association-wide journal	U.S. $135.00	with Electronic Option $155.00
Select two Association-wide journals	U.S. $145.00	with Electronic Option $165.00
All three Association-wide journals	U.S. $155.00	with Electronic Option $175.00

Associate membership for students residing in the United States and Canada:

Select one Association-wide journal	U.S. $20.00	with Electronic Option $40.00
Select two Association-wide journals	U.S. $30.00	with Electronic Option $50.00
All three Association-wide journals	U.S. $40.00	with Electronic Option $60.00

Electronic journal option available for an additional U.S. $20.00 to above-mentioned full-membership and associate-membership dues.

In addition, full members may belong to one or more Sections: Accounting, Behavior and Organizations; Accounting Programs Leadership Group; American Taxation Association; Artificial Intelligence/Emerging Technologies; Auditing; Financial Accounting and Reporting; Gender Issues in Accounting; Government and Nonprofit; Information Systems; International Accounting; Management Accounting; Public Interest; Teaching and Curriculum; and Two-Year College. Each Section assesses its own annual dues, which are collected by the Association.

Editorial correspondence and all manuscripts should be emailed to taruw@u.washington.edu or sent to Professor Terry Shevlin, Senior Editor, *The Accounting Review*, School of Business, Box 353200, University of Washington, Seattle, WA 98195-3200. As of June 1, 2005, all manuscripts should be emailed to TARUAZ@email.arizona.edu or sent to Professor Dan Dhaliwal, Senior Editor. *The Accounting Review*, The University of Arizona, Department of Accounting, McClelland Hall 301, 1130 E. Helen Street, Tucson, AZ 85721-0108.

The submission fee of $125.00 for members of the AAA or $200.00 for nonmembers should be paid online (VISA or MasterCard only) at: https://aaahq.org/AAAforms/journals/tarsubmit.cfm must be paid when article is submitted. Request for reprint permission, subscriptions, advertisements, and dues should be sent to American Accounting Association, 5717 Bessie Drive, Sarasota, FL 34233-2399 • Telephone: (941) 921-7747 • Fax: (941) 923-4093 • Email: Office@aaahq.org. Notice of change of address should be mailed at least eight weeks in advance to ensure undelayed receipt of *The Accounting Review.*

The Accounting Review (ISSN 0001-4826) is published four times a year in January, April, July, and October by the American Accounting Association, 5717 Bessie Drive, Sarasota, Florida 34233-2399. General subscriptions are available at the annual rate of U.S. $170; membership subscription rate is $25 with discounts available; and emeritus subscription rate is $8.75. Periodical postage paid at Sarasota, Florida and additional mailing offices. **POSTMASTER:** Send address change to ***The Accounting Review,*** 5717 Bessie Drive, Sarasota, Florida 34233-2399.

© 2005 American Accounting Association. All rights reserved. Printed in the United States of America.

THE ACCOUNTING REVIEW

A QUARTERLY JOURNAL OF THE
AMERICAN ACCOUNTING ASSOCIATION

Senior Editor
Terry Shevlin
Editors
Lawrence Brown
Patricia Dechow
S. Jane Kennedy
Marlys Gascho Lipe
Madhav Rajan

VOL. 80 OCTOBER 2005 No. 4

ROBERT M. BOWEN, ANGELA K. DAVIS, and DAWN A. MATSUMOTO
Emphasis on Pro Forma versus GAAP Earnings in Quarterly Press Releases: Determinants, SEC Intervention, and Market Reactions 1011
ANTONIO DAVILA and GEORGE FOSTER
Management Accounting Systems Adoption Decisions: Evidence and Performance Implications from Early-Stage/Startup Companies 1039
SUNIL DUTTA and STEFAN REICHELSTEIN
Stock Price, Earnings, and Book Value in Managerial Performance Measures 1069
RALF EWERT and ALFRED WAGENHOFER
Economic Effects of Tightening Accounting Standards to Restrict Earnings Management 1101
JERE R. FRANCIS, INDER K. KHURANA, and RAYNOLDE PEREIRA
Disclosure Incentives and Effects on Cost of Capital around the World 1125
RANJANI KRISHNAN, JOAN L. LUFT, and MICHAEL D. SHIELDS
Effects of Accounting-Method Choices on Subjective Performance-Measure Weighting Decisions: Experimental Evidence on Precision and Error Covariance ... 1163
BRIAN MITTENDORF and YUN ZHANG
The Role of Biased Earnings Guidance in Creating a Healthy Tension between Managers and Analysts 1193
EMAD MOHD
Accounting for Software Development Costs and Information Asymmetry 1211
JONATHAN L. ROGERS and PHILLIP C. STOCKEN
Credibility of Management Forecasts 1233
Editorial Data 1261
Editorial Policy and Style Information 1263
Index 1267

Editorial Staff of *The Accounting Review*
2004–2005

SENIOR EDITOR
Terry Shevlin, University of Washington
EDITORS
Lawrence Brown, Georgia State University
Patricia Dechow, University of Michigan
S. Jane Kennedy, University of Washington
Marlys Gascho Lipe, University of Oklahoma
Madhav Rajan, Stanford University
EDITORIAL ASSISTANT
Kate Flynn Connolly, University of Washington

American Accounting Association

EXECUTIVE DIRECTOR
Tracey E. Sutherland
COMMUNICATIONS DEPARTMENT
Beverly Harrelson
Kathy Casper
Diane Hazard
Judy Cothern
Marcia Craig (subcontractor)
Jan Kovarik (subcontracted)
OTHER AAA STAFF
Debora Gardner
Roland LaTulip
Linda Watterworth
Mary Cole
Pat Stein
James Szelminski
Barbara Brady
Peggy Turczyn
Myriam Chacon
Deirdre Harris (subcontracted)

Editorial Advisory and Review Board

Shannon W. Anderson, Rice University
Benjamin C. Ayers, University of Georgia
Frances L. Ayres, University of Oklahoma
William R. Baber, The George Washington University
Stephen P. Baginski, University of Georgia
Ramji Balakrishnan, The University of Iowa
Tim Baldenius, Columbia University
Orie E. Barron, Pennsylvania State University
Eli Bartov, New York University
Anne L. Beatty, The Ohio State University
Robert J. Bloomfield, Cornell University
Christine A. Botosan, University of Utah
Robert M. Bowen, University of Washington
Brian J. Bushee, University of Pennsylvania
Robert M. Bushman, The University of North Carolina at Chapel Hill
Paul K. Chaney, Vanderbilt University
C. Bryan Cloyd, University of Illinois at Urbana–Champaign
William M. Cready, The University of Texas at Dallas
Mark L. DeFond, University of Southern California
Michael J. Eames, Santa Clara University
Merle M. Erickson, University of Chicago
Paul Fischer, Pennsylvania State University
Jere R. Francis, University of Missouri–Columbia
Jennifer Francis, Duke University
Jonathan C. Glover, Carnegie Mellon University
Wayne R. Guay, University of Pennsylvania
David A. Guenther, University of Colorado at Boulder
Mahendra Gupta, Washington University
D. Eric Hirst, The University of Texas at Austin
Christopher D. Ittner, University of Pennsylvania
James J. Jiambalvo, University of Washington
Sanjay Kallapur, Purdue University
Ron Kasznik, Stanford University
Bin Ke, Pennsylvania State University
Deen Kemsley, Tulane University
William R. Kinney, Jr., The University of Texas at Austin
Lisa L. Koonce, The University of Texas at Austin
William N. Lanen, University of Michigan
Robert C. Lipe, University of Oklahoma
Joan L. Luft, Michigan State University
Russell J. Lundholm, University of Michigan
Joseph Magliolo III, Southern Methodist University
Laureen A. Maines, Indiana University
Steven R. Matsunaga, University of Oregon
Maureen F. McNichols, Stanford University
Kenneth A. Merchant, University of Southern California
Lillian F. Mills, The University of Arizona
Donald V. Moser, University of Pittsburg
James N. Myers, University of Illinois at Urbana–Champaign
Linda Myers, University of Illinois at Urbana–Champaign
Karen K. Nelson, Rice University
Mark W. Nelson, Cornell University
Patricia C. O'Brien, University of Waterloo
Kathy R. Petroni, Michigan State University
Morton Pincus, The University of Iowa
Jamie H. Pratt, Indiana University
Shivaram Rajgopal, University of Washington
D. Shores, University of Washington
Richard G. Sloan, University of Michigan
Geoffrey B. Sprinkle, Indiana University
Theodore Sougiannis, University of Illinois at Urbana–Champaign
Michael T. Stein, University of Oregon
Hun-Tong Tan, Nanyang Technology University/Singapore
Richard M. Tubbs, The University of Iowa
Sandra Vera-Muñoz, University of Notre Dame
Robert E. Verrecchia, University of Pennsylvania
Beverly R. Walther, Northwestern University
Michael Welker, Queen's University
Michael Willenborg, University of Connecticut
Hong Xie, University of Illinois at Urbana–Champaign

PAST EDITORS

1926–1929	William A. Paton	1973–1975	Thomas F. Keller
1929–1943	Eric L. Kohler	1976–1978	Don T. DeCoster
1944–1947	A. C. Littleton	1978–1983	Stephen A. Zeff
1948–1949	Robert L. Dixon	1983–1987	Gary L. Sundem
1950–1959	Frank P. Smith	1987–1990	William R. Kinney, Jr.
1960–1962	Robert K. Mautz	1990–1994	A. Rashad Abdel–khalik
1963–1964	Lawrence L. Vance	1994–1997	Robert P. Magee
1965–1967	Wendell Trumbull	1997–2000	Gerald L. Salamon
1968–1970	Charles H. Griffin	2000–2002	Linda Smith Bamber
1971–1972	Eldon S. Hendriksen	2002–2005	Terry Shevlin

THE ACCOUNTING REVIEW
Vol. 80, No. 4
2005
pp. 1011–1038

Emphasis on Pro Forma versus GAAP Earnings in Quarterly Press Releases: Determinants, SEC Intervention, and Market Reactions

Robert M. Bowen
University of Washington

Angela K. Davis
Washington University

Dawn A. Matsumoto
University of Washington

ABSTRACT: Earnings press releases provide managers a forum to present their firm's quarterly financial information and perhaps influence perceptions of the firm's stakeholders. We explore the use of managerial emphasis as a disclosure tool and contribute to the debate over pro forma earnings. We examine (1) the determinants of emphasis placed on pro forma and GAAP earnings within quarterly earnings press releases, (2) whether there has been a shift away from emphasizing pro forma earnings toward GAAP earnings, and (3) whether stock market reactions to earnings news were influenced by emphasis placed on metrics within the press release. We find that firms emphasize metrics that are more value-relevant and portray more favorable firm performance. We also find that the extent of a firm's media coverage affects managers' emphasis decisions. Further, our results indicate a highly significant shift toward GAAP emphasis and away from pro forma emphasis in 2002 relative to 2001. Finally, our stock market tests suggest that greater emphasis on an earnings metric results in a

---

We thank two anonymous referees, the editor, Patricia Dechow, Mark Bradshaw, Qiang Cheng, Ted Christensen, Ole-Kristian Hope, Jane Kennedy Jollineau, Carol Marquardt, Shiva Rajgopal, Lisa Sedor, Terry Shevlin, Tzachi Zach, and workshop participants at the 2003 CFEA Conference at Indiana University, Pennsylvania State University, Washington University, University of British Columbia, University of California, Riverside, University of Oregon, University of Toronto, The 2003 University of Utah Winter Accounting Conference, and the University of Washington for their comments. We thank Josh Wool, Philip Wool, Juan Wang, Greg Sierra, Holly McCarthy, and Rukhein Davis for their research assistance. We also thank Corey Murata, University of Washington Business Computer-Based Services Librarian, for his assistance in data collection. Professors Bowen and Matsumoto recognize the financial support of the Accounting Development Fund and the Business School Research Fund at the University of Washington. Professor Bowen recognizes the support of the Herbert O. Whitten Professorship and Professor Matsumoto recognizes the support of the Lane A. Daley Faculty Fellowship and the CFO Forum.

Editor's note: This paper was accepted by Patricia Dechow.

Submitted March 2004
Accepted March 2005

stronger market reaction to the surprise in that metric. Overall, these findings are consistent with managers using emphasis in the earnings press release as a disclosure tool and this emphasis influencing at least one important stakeholder group—investors.

Keywords: *press release; emphasis; metrics; disclosure; pro forma and GAAP earnings; determinants; stock market reactions.*

Data Availability: *All data used in this study are publicly available.*

I. INTRODUCTION

The quarterly announcement of financial results (hereafter, the "earnings release" or "press release") is an important opportunity for managers to communicate their firm's performance to shareholders and other stakeholder groups. Until recently, there was little regulation over the wording, format, or even the metrics included in the earnings release. This lack of regulation is at least partially responsible for the proliferation over the past decade in the reporting of alternative non-GAAP performance metrics such as "pro forma" earnings (Bradshaw and Sloan 2002).[1] Several recent studies have examined the use of and market reaction to pro forma earnings numbers (Bhattacharya et al. 2003; Lougee and Marquardt 2004). The Securities and Exchange Commission (SEC) has closely monitored pro forma reporting, first issuing cautionary advice on the use of pro forma earnings (SEC 2001), and then passing Regulation G (SEC 2002), which establishes rules for the use of non-GAAP metrics.

The purpose of this paper is to examine the extent to which managers are deliberate in the emphasis they place on alternative performance metrics within the earnings press release.[2] We examine a context where managers report both pro forma and GAAP earnings and thus, have the ability to place different levels of emphasis on these two metrics in the quarterly press release. This paper examines a different aspect of the use of non-GAAP metrics than has been considered in prior studies. Rather than examining the *choice to report* pro forma earnings, we examine factors associated with the *emphasis placed* on pro forma earnings compared to GAAP earnings, given that both numbers are reported. We also examine whether there has been a shift away from emphasizing pro forma earnings in response to the SEC's (2001) cautionary advice and heightened investor scrutiny of accounting disclosures following recent accounting scandals.[3] Finally, we examine whether the emphasis placed on pro forma and GAAP earnings in quarterly press releases affects the stock market reaction to these numbers.

We measure emphasis in two ways. First, we measure the *level* of emphasis by identifying where pro forma and GAAP earnings are first mentioned in the press release: (1) in the headline, (2) in the first or second paragraph, (3) further down in the body of the release, or (4) only in the financial statements provided at the end of the release. Based on this placement, we assign each firm-quarter a pro forma and a GAAP emphasis score, which allows us to assess the absolute importance of the performance metric in company press releases. Second, we measure *relative* emphasis by differencing the emphasis scores for pro forma and GAAP earnings. This is a proxy for the difference in importance between the two metrics as portrayed by management.

---

[1] Pro forma earnings are earnings that have been adjusted in a way not recognized by GAAP—for example, adding back stock-compensation-related charges and goodwill amortization (pre-SFAS No. 141). GAAP earnings are either bottom-line earnings or a recognized above-line earnings number (such as earnings before discontinued operations or earnings before extraordinary items).

[2] By deliberate emphasis we mean a conscious, intentional decision on the part of management to emphasize particular information. Gibbins et al. (1990) refer to two dimensions to managing disclosures—ritualistic and opportunistic. Rather than use the term "opportunistic," we use the term "deliberate" because we believe managers may be acting in the interest of shareholders by emphasizing the more value-relevant measures. Thus, this paper examines whether press releases tend to be ritualistic (i.e., boilerplate) or deliberate. If a manager's emphasis decision is intended to mislead investors, the decision would be considered "opportunistic," which, by our definition, is a subset of deliberate behavior.

[3] Our sample period ends in the 3rd quarter of 2002 and thus our analysis should not be affected by the SEC's passage of Regulation G in November 2002.

Our key findings are as follows. (1) Firms with less value-relevant GAAP earnings tend to place greater relative emphasis on pro forma earnings. Specifically, firms in high-technology industries and firms with a history of prior losses place less emphasis on GAAP earnings and place greater *relative* emphasis on pro forma earnings (consistent with our hypotheses). However, these firms do not appear to place greater *levels* of emphasis on pro forma earnings (contrary to conventional wisdom and inconsistent with our hypothesis). (2) Firms emphasize the metric that portrays better performance. Firms with positive seasonally adjusted changes in pro forma or GAAP earnings place greater emphasis on that metric. In addition, the subset of firms reporting pro forma profits but GAAP losses place more emphasis on pro forma earnings and less emphasis on GAAP earnings in terms of both the level of emphasis and relative emphasis. (3) Firms with greater media coverage are more likely to emphasize pro forma earnings and less likely to emphasize GAAP earnings. (4) Firms decrease the level of emphasis on pro forma earnings and increase the level of emphasis on GAAP earnings in 2002 versus 2001 subsequent to heightened SEC scrutiny on pro forma earnings. We also find that firms exposed to greater media coverage increase their emphasis on GAAP earnings and decrease their relative emphasis on pro forma earnings in 2002. (5) Greater emphasis on pro forma earnings results in a stronger market reaction to the surprise in pro forma earnings reported in the quarterly earnings announcement. The results are similar but somewhat weaker for GAAP earnings. Further, the incremental information content of pro forma earnings increases with greater relative emphasis on this metric.

Overall, our results suggest that the emphasis placed on various metrics within the earnings release is neither random nor boilerplate. Rather, managers appear to be deliberate in the metrics they emphasize in their press releases and the perceived net benefit of emphasizing non-GAAP metrics declined in 2002 subsequent to SEC cautions and other negative publicity. Finally, our results are consistent with emphasis influencing current and potential investors.

This paper contributes to the literature in three ways. First, we extend the disclosure literature by investigating how managers use emphasis as a disclosure tool within earnings press releases. Prior literature has examined issues related to the type of metrics disclosed (Bhattacharya et al. 2003; Lougee and Marquardt 2004; Francis et al. 2003); however, few studies have examined the emphasis placed on the information disclosed. Bradshaw and Sloan (2002) and Bhattacharya et al. (2003) both provide some descriptive data on the emphasis placed on pro forma earnings in press releases; however, neither study examines the determinants of the emphasis placed on various metrics or the stock market reaction to such emphasis. In addition, numerous prior studies have examined narratives provided in annual reports to explain corporate performance (e.g., Bettman and Weitz 1983; Aerts 2001) but have not examined the emphasis placed on performance metrics. Our study most closely relates to Schrand and Walther (2000), who find that firms are more likely to "remind" readers about a non-recurring prior period gain—resulting in a lower benchmark against which to compare the current period's earnings. We expand on the idea of strategically reporting information but, rather than focusing on the type of information provided (e.g., a prior period gain/loss), we focus on the emphasis placed on information within a release.

Second, we contribute to the current debate on the emphasis placed on pro forma earnings within earnings releases. The events of 2001 and 2002 suggest that emphasis in press releases was becoming an increasing concern among prominent industry groups and the SEC (see Figure 1). Although initial guidelines issued jointly by the National Investor Relations Institute (NIRI) and the Financial Executives Institute (FEI) (NIRI 2001) did not discourage firms from placing greater emphasis on pro forma earnings than GAAP earnings, subsequent guidelines (issued in October 2002) explicitly encourage firms to emphasize GAAP earnings over pro forma earnings (NIRI 2002). In addition, in November 2002, the SEC passed Regulation G, which established rules for the use of non-GAAP metrics (such as pro forma earnings). These rules require, among other things, that GAAP information be presented with the same prominence as non-GAAP information. The fact that the emphasis placed on pro forma earnings within the release is specifically addressed in these guidelines suggests that prominent industry groups (such as NIRI) and the SEC believe emphasis is an important disclosure tool.

Third, we address the issue of whether managers are rational in their efforts to alter investors' perceptions through deliberate emphasis. In a recent experimental study, Elliott (2005) finds that unsophisticated investors' judgments about past performance are significantly higher when pro forma earnings are presented before GAAP earnings, suggesting that emphasis affects the judgments of at least a subset of investors. In addition, the Incomplete Revelation Hypothesis (IRH, Bloomfield 2002) states that, "statistics that are more costly to extract from public data are less completely revealed by market prices." Under the IRH, making it easier to "extract" the information content in certain metrics leads to these metrics being more fully impounded in prices. We provide evidence on the veracity of the IRH and augment the findings of Elliott (2005) in an archival setting by investigating whether the stock market reaction to unexpected earnings varies with different levels of emphasis.

In the next section, we develop hypotheses related to the determinants of emphasis. In Section III, we discuss our sample and provide descriptive statistics on the emphasis placed on pro forma versus GAAP performance in quarterly press releases. Section IV presents the results of our analysis of the determinants of emphasis, including the *change* in emphasis on pro forma and GAAP earnings in 2002 relative to 2001. Section V discusses tests of the market's reaction to managers' emphasis decision. We offer concluding remarks in the last section.

II. HYPOTHESIZED DETERMINANTS OF EMPHASIS

Value Relevance

One argument for the rise in pro forma reporting is the demand for more value-relevant information. A number of prior studies suggest that when the value relevance of earnings is low, managers provide additional disclosures to the market, such as conference calls (Tasker 1998) or balance sheet information (Chen et al. 2002). More importantly, Lougee and Marquardt (2004) find some evidence that firms with lower value relevance of earnings are more likely to report pro forma numbers. These studies indicate that managers disclose additional or different information when earnings are less useful. If managers view emphasis as an important disclosure tool, then these prior findings suggest that managers will behave strategically and emphasize this alternative information more (when it is presented) and standard GAAP earnings less. Thus, we hypothesize:

H1: Firms with lower value relevance of earnings place higher levels of emphasis on pro forma earnings, lower levels of emphasis on GAAP earnings, and greater relative emphasis on pro forma earnings in their quarterly press releases, *ceteris paribus*.

Because the use of historical association between earnings and stock returns would severely limit our sample size, we rely on three proxies for low value relevance: a history of prior losses, earnings variability, and membership in a high-tech industry. Losses have been shown to have lower associations with prices (Collins et al. 1999) and returns (Hayn 1995; Franzen 2002). We use a dummy variable (*PRLOSS*) equal to 1 if the firm has four consecutive quarters of losses (quarterly Compustat item # 8 less than zero) prior to the quarter examined. Lougee and Marquardt (2004) find evidence supporting their hypothesis that firms with highly variable earnings benefit more from pro forma reporting. We use the standard deviation (over the prior eight quarters) of earnings divided by assets (quarterly Compustat items #8 ÷ #44) as our measure of earnings variability (*STDROA*). Prior research also supports the idea that high-technology firms have less value-relevant earnings (Collins et al. 1997; Lev and Zarowin 1999). We use a dummy variable to indicate firms in high-technology industries (*HITECH*) as defined by Francis and Schipper (1999). See the notes to Table 3 for a list of industries considered to be high-technology.

Reporting "Better" Performance

In addition to emphasizing metrics that are more value-relevant, managers also have incentives to emphasize metrics that portray better firm performance. Prior research supports the idea that managers disclose information in an attempt to influence stakeholders' perceptions of earnings (Schrand and Walther 2000), suggesting that managers may be opportunistic in their disclosures. Further, regulators and the media have criticized firms' presentation of information in their press releases.[4] On the surface, this hypothesis may seem to contradict our prior hypothesis. However, it is possible that both factors influence managers' emphasis decisions in that one factor can exaggerate or mitigate the effect of the other. For example, management of a firm with low value relevance of GAAP earnings might tend to report pro forma earnings earlier in the press release, but decide whether to place the news in the headline depending on whether the metric also portrays better performance. Thus, we predict the following:

> **H2:** Firms emphasize performance metrics in their quarterly press releases that portray better firm performance, *ceteris paribus*.

One common benchmark for "good" performance is improvement in earnings relative to the same quarter last year.[5] We define ΔPF^{+} ($\Delta GAAP^{+}$) as equal to 1 if the change in pro forma (GAAP) earnings from the same quarter in the prior year (as reported in the actual press release) is positive, and 0 otherwise. Thus, our empirical prediction about the *level* of emphasis is that firms with positive seasonally adjusted changes in pro forma earnings place greater emphasis on pro forma earnings and firms with positive seasonally adjusted changes in GAAP earnings place greater emphasis on GAAP earnings in their quarterly press releases.

---

[4] For example, a *Wall Street Journal* article states, "In the past few years, companies increasingly have prettied up their earnings announcements by highlighting what their results would have been absent unpleasant blemishes, while granting less prominence to their actual results. That practice, which can be found in all industries, remains perfectly legal" (*WSJ* 2001).

[5] We focus on the sign of the earnings change rather than the magnitude for two reasons. First, studies suggest that managers place great importance on simply meeting or exceeding a benchmark. Burgstahler and Dichev (1997) provide evidence suggesting that managers take actions to avoid reporting negative earnings changes. Moreover, Graham et al. (2005) report that CFOs rank the "same quarter last year" as by far the most important earnings benchmark (above "analyst consensus estimate" and "reporting a profit"). Second, using the sign avoids problems with scalars. For example, the use of prior earnings as a scalar results in small denominator problems and potentially large outliers; since market value of equity and assets differ across growth/nongrowth and service/industrial firms, respectively, using these variables as scalars potentially introduces measurement error. However, we test the sensitivity of our results to the use of a dichotomous performance variable (see footnote 14).

For our tests of the *relative* emphasis placed on pro forma earnings versus GAAP earnings, we use a relative performance measure. We define $\Delta PFHIGH$ as equal to 1 if the change in pro forma earnings (from the same quarter in the prior year) is greater than the change in GAAP earnings, and 0 otherwise. Thus, we predict that firms with seasonally adjusted changes in pro forma earnings that are larger than their seasonally adjusted changes in GAAP earnings place more emphasis on pro forma earnings relative to GAAP earnings in their quarterly press releases.

Managers are also likely sensitive to the *level* of a performance metric—e.g., evidence in Burgstahler and Dichev (1997) suggests that managers take actions to avoid reporting losses. Rather than managing earnings to avoid reporting losses, managers could simply recast a GAAP loss as a pro forma profit and emphasize the pro forma results in their press release. We define $PF^{+}\_GAAP^{-}$ as equal to 1 if pro forma earnings are greater than zero but GAAP earnings are less than zero. We predict that firms with positive pro forma but negative GAAP earnings place a higher level of emphasis on pro forma earnings, a lower level of emphasis on GAAP earnings, and greater relative emphasis on pro forma earnings in their quarterly press releases.

Media Coverage

Earnings releases are generally written and sent out over a wire service (such as PR Newswire or Business Wire) where they may be picked up by various media sources for publication. While analysts working for large brokerage firms and large institutional investors likely have direct access to these wire services, the average investor as well as other stakeholders likely get their information from mainstream media sources such as the *Wall Street Journal*. Therefore, the extent to which managers view emphasis as an important disclosure tool likely depends on the extent of media coverage the firm receives (and thus, the likelihood that the earnings release is published in a major media outlet). Thus, our third hypothesis is:

> **H3:** Firms with greater media coverage place higher levels of emphasis on pro forma earnings, lower levels of emphasis on GAAP earnings, and greater relative emphasis on pro forma earnings in their quarterly press releases, *ceteris paribus*.

We measure media coverage (*MEDCOV*) as the number of articles in the prior year in which the company is mentioned in the headline or lead paragraph of the three largest U.S. newspapers (*Wall Street Journal*, *USA Today*, and *The New York Times*) as well as five of the largest magazines (*Time*, *BusinessWeek*, *Newsweek*, *Fortune*, and *Forbes*).

Sophisticated Users

As discussed above, one of the primary consumers of firms' earnings releases are sophisticated users such as financial analysts and large, institutional investors. These sophisticated users likely have direct access to a firm's earnings release and closely monitor its performance. Moreover, managers often justify the use of pro forma reporting by claiming financial analysts and institutional investors find pro forma earnings incrementally informative.[6] If the decision to report pro forma earnings in turn leads managers to emphasize this metric, then we would expect firms with a greater proportion of sophisticated users to emphasize pro forma earnings. On the other hand, one might argue that sophisticated users do not need managers to emphasize pro forma numbers because as long as the information is provided, sophisticated users can locate it and use it. This argument would suggest no relation between the proportion of sophisticated users and a firm's emphasis on pro forma earnings. Given these two opposing arguments, we hypothesize a non-negative relation between emphasis on pro forma earnings and the degree of sophisticated users:

> **H4:** Firms with more sophisticated users of accounting information place similar or greater emphasis on pro forma earnings compared to firms with fewer sophisticated users, *ceteris paribus.*

We use two proxies for sophisticated users: the number of analysts following the firm and the percent of shares owned by institutional investors. Our measure of analyst following (*ANALYSTS*) is the number of analyst forecasts in the consensus forecast outstanding at the end of the quarter, as provided by I/B/E/S.[7] Our measure of institutional ownership is the percent of shares owned by institutions (*%INST*) reported on Compact Disclosure for the closest calendar quarter to the quarter examined.

Changes in the Emphasis on Pro Forma and GAAP Earnings

Between the SEC's (2001) cautionary advice and the increased scrutiny placed on accounting information as a result of numerous accounting scandals, managers of firms reporting pro forma earnings likely became more concerned about investors' perceptions of the credibility of their accounting information in 2002 relative to 2001. In response to these concerns, and as an alternative to dropping pro forma reporting, managers could: (1) continue to report pro forma earnings but decrease the emphasis placed on these numbers and/or (2) elevate the emphasis placed on GAAP earnings. Thus, we hypothesize:

> **H5:** Firms have reduced emphasis on pro forma earnings and/or increased emphasis on GAAP earnings in 2002 relative to 2001, *ceteris paribus.*

To test the change in emphasis from 2001 to 2002, we include a *POST* variable in our analysis, which equals 1 if a firm-quarter is in 2002, and 0 otherwise.

The above arguments suggest that the increased scrutiny of accounting information and concerns over credibility are at least partially responsible for the hypothesized decline in emphasis on pro forma earnings and increase in emphasis on GAAP earnings. In other words, while the benefits of emphasizing pro forma earnings may not have changed for a given firm, the costs (in terms of reduced credibility) likely increased. Thus, the *net* benefits have likely decreased and any changes in emphasis over the time period examined should be associated with the degree of scrutiny to which a firm is subject. Thus, we hypothesize:

---

[6] For example, in a survey of attendees at a Financial Executives International conference, 27 percent indicated that they include pro forma numbers at analysts' request (*Investor Relations Business* 2001). Moreover, in a survey of portfolio managers, 76 percent indicated that they found pro forma reporting at least somewhat useful and 67 percent said they would oppose banning pro forma reporting from press releases (CFO.com 2001).

[7] If no data are available for the firm-quarter being examined but data are available for the prior *and* subsequent quarters, then we use the number of analysts in the prior quarter as a proxy. If no data are available for the quarter being examined and data are only available either before or after (but not both), then we consider these firms to have either previously lost coverage or subsequently gained coverage and we code these firms as having zero analyst following during the firm-quarter.

> **H6:** Firms subject to greater scrutiny are more likely to decrease emphasis on pro forma earnings and/or increase emphasis on GAAP earnings in 2002 relative to 2001, *ceteris paribus.*

We expect that firms receiving high levels of media coverage receive greater scrutiny from their stakeholders because the overall level of information available about the firm is greater. We include the *POST* variable interacted with the media coverage variable (*POST*MEDCOV*) to test this hypothesis.

Finally, prior studies have suggested that firms are more likely to report pro forma earnings when they have unusual or nonrecurring items (Lougee and Marquardt 2004). Similarly, firms may be more likely to emphasize pro forma earnings if the differences between pro forma and GAAP earnings are larger. Thus, we include the signed difference between pro forma and GAAP earnings, scaled by total assets, (*DIFF*) as a control variable.

III. DATA AND DESCRIPTIVE EVIDENCE

Sample Selection

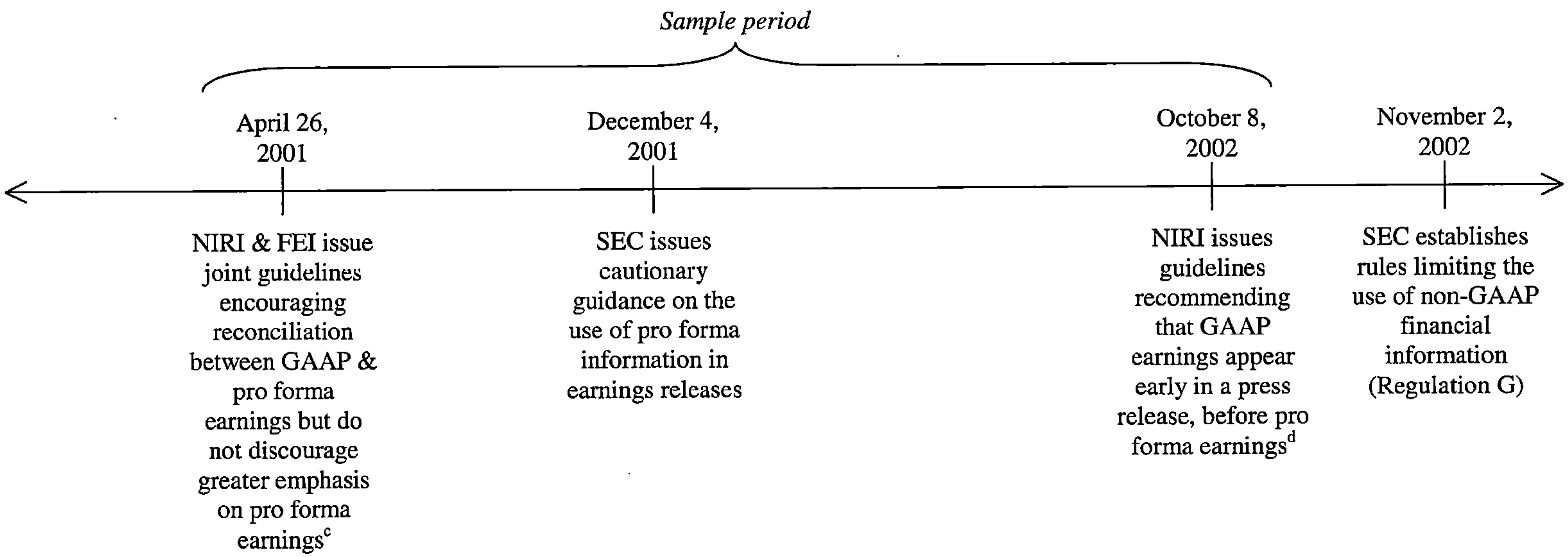
Using the Nexis/Lexis Academic Universe database, we search the Business Newswire and the PR Newswire archives to identify firms reporting pro forma earnings metrics between April 7, 2001 and June 7, 2001. We use the key words "pro forma" or "EBITDA" to identify earnings releases with potential pro forma earnings and review the associated headlines to filter out press releases that do not relate to quarterly earnings announcements for the first or second fiscal quarter of 2001. This search process yields 1,215 firms that include pro-forma- or EBITDA-based metrics in their quarterly earnings press release. Next, we eliminate nondomestic firms and firms that do not have 2001 data available on Compustat, CRSP, or I/B/E/S, which reduces the sample to 691 firms.[8] Because hand collection of these data is time intensive, we randomly select a subsample of 550 of the 691 firms to review for potential inclusion in our sample.

For each firm, we collect information related to the emphasis placed on metrics within the release (the following section describes our measures of emphasis). We start with the quarter identified in our initial search and then collect data for the two subsequent quarters of 2001. We then collect data for the corresponding three quarters in 2002. The time period selected is designed to facilitate our investigation of any changes in emphasis subsequent to recent accounting scandals and regulatory cautions. The Enron scandal broke in October 2001 and the SEC's cautionary advice on pro forma reporting was issued in December 2001 (see Figure 1). Both of these events likely occurred *after* the first three quarterly earnings releases in our 2001 sample period and a comparison of emphasis between the two years should identify whether managers quickly responded to heightened concerns about pro forma reporting. It is also important to note that our sample period ends in the third quarter of 2002, which is *prior* to the SEC's passage of Regulation G in November 2002.

---

[8] We only determined whether the firm was listed on the database, not whether they had all the data necessary to calculate all our independent variables. Thus, we subsequently lose some observations for lack of data (but the data loss is substantially lower than it might otherwise have been without this initial screen).

FIGURE 1
Timeline: Guidelines and Rules Related to Disclosure of Financial Information in Earnings Press Releases[a,b]


Sample period
April 26, 2001
NIRI & FEI issue joint guidelines encouraging reconciliation between GAAP & pro forma earnings but do not discourage greater emphasis on pro forma earnings[c]
December 4, 2001
SEC issues cautionary guidance on the use of pro forma information in earnings releases
October 8, 2002
NIRI issues guidelines recommending that GAAP earnings appear early in a press release, before pro forma earnings[d]
November 2, 2002
SEC establishes rules limiting the use of non-GAAP financial information (Regulation G)

---

[a] Earnings press releases were essentially unregulated prior to April 2001. NIRI is the National Investor Relations Institute, FEI is the Financial Executives Institute, and SEC is the Securities and Exchange Commission

[b] Other events from 2001–02 include:
October 2001: Enron scandal becomes public
November 2001: Survey of portfolio managers finds 76 percent find pro forma reporting at least somewhat useful and 67 percent would oppose ban of pro forma reporting
November 2001: Survey of attendees at an Financial Executives Institute conference reports that 27 percent include pro forma numbers at analysts' request

[c] The guidelines state, "It is usually desirable to display prominently in the headlines of the earnings press release the most meaningful information. Most often, this is GAAP *and/or pro forma earnings per share*" (emphasis added).

[d] The guidelines state, "GAAP earnings should ideally appear in the first paragraph and before discussing pro forma results."

We eliminate firms that report traditional EBITDA metrics in the initial quarter and firms without six quarters of press releases, resulting in the elimination of 297 firms.[9] Our sample is described in Table 1 and consists of six quarters of data for 253 firms, or 1,518 firm-quarters. We lose 61 additional firm-quarter observations because they do not have data available on Compustat, I/B/E/S, or Compact Disclosure to calculate our independent variables. In addition, we eliminate 220 firm-quarters in which firms did not report pro forma earnings in a quarter subsequent to the first quarter of 2001 because we require the value of pro forma earnings to compute certain independent variables (e.g., ΔPF^+ and $PF^+\_GAAP^-$). Finally, in 38 firm-quarters, the firm provides the current year earnings on a pro forma basis but does not provide the prior year earnings on a pro forma basis in the press release. We also exclude these observations in our determinants tests because we cannot compute the independent variable, ΔPF^+. The final sample for our determinants tests, reported in Section IV, consists of 1,199 firm-quarters. For the stock market reaction tests discussed in Section V, we lose an additional 11 firm-quarters (two firms) because of insufficient data on CRSP to calculate returns.

Dependent Variables—Emphasis on Pro Forma and GAAP Earnings

For each firm-quarter in our sample, we read and code information in the press release to determine the emphasis placed on pro forma and GAAP earnings. The most common

TABLE 1
Sample Selection Criteria across Alternative Analyses

	Firm-Quarters	Firms[a]
Full Sample	1,518	253
Missing data on Compustat	(14)	(4)
	1,504	249
Missing data on I/B/E/S	(5)	—
	1,499	249
Missing data on Compact Disclosure	(42)	(4)
	1,457	245
Did not report PF in current quarter[b]	(220)	(31)
	1,237	214
Did not report prior year PF amount[c]	(38)	(6)
Sample used for determinants tests (Section IV)	1,199	208
Missing data to compute size-adjusted returns	(11)	(2)
Sample used for stock market reaction tests (Section V)	1,188	206

[a] Firms with at least one observation in each year, 2001 and 2002.
[b] Firm-quarters in which firms did not report earnings on a pro forma (PF) basis for the current period (i.e., firms discontinuing the use of pro forma reporting after Q1 2001).
[c] Firms-quarters in which firms reported earnings on a pro forma basis for the current period but did not report earnings on a pro forma basis for the prior period.

---

[9] EBITDA is earnings before interest, taxes, depreciation, and amortization. We initially searched based on EBITDA in order to identify firms that reported "adjusted EBITDA" metrics. Firms that reported traditional EBITDA were eliminated from the sample because we do not consider it to be a pro forma metric. Firms that reported "adjusted" EBITDA metrics in which additional items are excluded from earnings remain in the sample since we consider adjusted EBITDA to be a pro forma metric.

pro forma adjustments in our sample are goodwill amortization (54 percent), stock-based compensation related charges (47 percent), restructuring charges (36 percent), and gains/losses on the sale of assets (29 percent). GAAP earnings are either bottom-line earnings or a GAAP-recognized above-line earnings numbers such as earnings before extraordinary items or earnings before discontinued operations.

We code several attributes of the earnings release including the following: (1) the first earnings metric (GAAP or pro forma) mentioned in the release, (2) whether the metric was mentioned in the headline, and (3) the paragraph number where the earnings metric is first mentioned in the release or whether the metric is mentioned only in the financial statements provided at the end of the release. Given that our sample selection process was designed to identify pro forma reporters, it is not surprising that the majority of firms mention pro forma earnings first (64 percent) relative to GAAP earnings (36 percent).

We measure the *level* of emphasis based on the following four-point scale:

Location in Press Release from Top to Bottom	**Emphasis Score**	**Ordinal Measure of Emphasis**
Reported in the headline	4	most emphasis
Reported in the first/second paragraph[10]	3	↑
Reported in paragraph three or later	2	↓
Reported in the financial statements only	1	least emphasis

Descriptive data on "pro forma emphasis" (*PFEMP*) and "GAAP emphasis" (*GAAPEMP*) are provided in Table 2, Panel A. Over the entire sample period, pro forma earnings tend to be reported earlier in the press release than GAAP earnings—23 percent of firm-quarters report pro forma in the headline and 52 percent report it in the first or second paragraph compared to 7 percent and 37 percent for GAAP earnings, respectively. Pro forma earnings are reported only in the financial statements for 2 percent of the observations, compared to 19 percent of observations for GAAP earnings. As indicated above, the sample excludes observations where pro forma earnings are discontinued because we cannot compute the change in pro forma earnings when a pro forma observation is missing. We examine the frequency of this occurrence and find that pro forma reporting was discontinued after the first quarter of 2001 in 15 percent of the observations, consistent with the net benefit of pro forma reporting declining over the sample period (H5).

Table 2 also provides a breakdown of emphasis levels across the two years in our sample and thus, provides descriptive data on the change in the level of emphasis on pro forma and GAAP earnings from 2001 to 2002. These data indicate a substantial change in the level of emphasis placed on both pro forma and GAAP earnings metrics across the two years. The percent of firm-quarters in which GAAP earnings are mentioned first (untabulated) increased from 15 percent in 2001 to 35 percent in 2002. The percent of firm-quarters in which GAAP earnings are mentioned in the headlines increased from 6 percent to 9 percent. In contrast, the firm-quarters in which pro forma earnings are mentioned first (untabulated) and the firm-quarters in which pro forma earnings are mentioned in the headlines both decreased (from 85 to 65 percent and from 26 to 20 percent, respectively). All of these differences are significant at the 5 percent level or less using Chi-squared tests

---

[10] We group together first and second paragraphs because many press releases have very short first paragraphs that are not substantive (i.e., they are often one or two sentences stating that the company announced quarterly earnings).

TABLE 2
Descriptive Statistics on Measures of Emphasis (Dependent Variables)

Panel A: Firm-Quarter Level Analysis of Changes in Level of Emphasis on Pro Forma and GAAP Earnings (n = 1,199)

	Pro Forma Earnings			GAAP Earnings		
	Combined	2001	2002	Combined	2001	2002
Percent of firm-quarters where the metric is:						
Reported in headline (4)	23%	26%	20%	7%	6%	9%
Reported in first or second paragraph (3)	52%	53%	51%	37%	33%	42%
Reported in third paragraph or higher (2)	23%	20%	26%	37%	34%	40%
Reported in financial statements only (1)	2%	2%	3%	19%	27%	9%
	100%	100%	100%	100%	100%	100%
	$\chi^2 = 12.84$, $p = 0.005$			$\chi^2 = 66.88$, $p = 0.001$		

Panel B: Firm-Quarter Level Analysis of Changes in Relative Emphasis between Pro Forma (PF) and GAAP Earnings (n = 1,199)

	RELEMP		
	Combined	2001	2002
Percent of firm-quarters where:			
(+3) PF in headline and GAAP in financial statements only	6%	8%	2%
(+2)	19%	24%	13%
(+1)	23%	25%	22%
(0) Same level of emphasis	42%	36%	50%
(−1)	6%	4%	8%
(−2)	3%	3%	4%
(−3) GAAP in headline and PF in financial statements only	1%	0%	1%
	100%	100%	100%
	$\chi^2 = 60.40$, $p = 0.001$		

with the exception of the decrease in GAAP earnings in the headline, which is significant at $p = 0.09$. These descriptive statistics are consistent with H5 that increased scrutiny on pro forma reporting caused managers to decrease emphasis on this metric in their press releases.

Our third dependent variable is a measure of *relative* emphasis (*RELEMP*) and is computed as *PFEMP* − *GAAPEMP*. In Panel B of Table 2, the scale for *RELEMP* ranges from 3 to −3, where the extremes show one metric in the headline and the other in the financial statements only. Zero is the midpoint of the scale and indicates the same emphasis, which could be high or low in terms of the *level* of emphasis. Descriptive data on *RELEMP* indicate that over the entire sample period, 42 percent of the observations place the same level of emphasis on pro forma and GAAP earnings, 48 percent place greater emphasis on pro forma earnings and 10 percent place greater emphasis on GAAP earnings. The breakdown of relative emphasis across the two years again suggests a shift toward emphasizing GAAP earnings relative to pro forma earnings. Specifically, in 57 percent of 2001 firm-quarters, more emphasis is placed on pro forma earnings relative to GAAP earnings, whereas this is true for only 37 percent of 2002 firm-quarters, a shift that is statistically significant at $p < 0.001$.

Independent Variables

Table 3 presents descriptive statistics on our independent variables. Consistent with prior findings that high-tech firms and firms reporting losses are more likely to issue results on a pro forma basis, our sample has a high concentration of high-technology firms (61 percent) and firms with a history of prior losses (45 percent). Approximately 56 (52) percent of the sample firm-quarters have a positive change in pro forma (GAAP) earnings and 21

TABLE 3
Descriptive Statistics on Independent Variables

Variable[a] (Hypothesis)	Mean	Standard Deviation	1st Quartile	Median	3rd Quartile
PRLOSS (H1)	0.4454	0.4972	0.0000	0.0000	1.0000
STDROA (H1)	0.0795	0.1543	0.0136	0.0316	0.0733
HITECH (H1)	0.6138	0.4871	0.0000	1.0000	1.0000
ΔPF^+ (H2)	0.5563	0.4970	0.0000	1.0000	1.0000
$\Delta GAAP^+$ (H2)	0.5188	0.4999	0.0000	1.0000	1.0000
$\Delta PFHIGH$ (H2)	0.5163	0.4999	0.0000	1.0000	1.0000
$PF^+\_GAAP^-$ (H2)	0.2102	0.4076	0.0000	0.0000	0.0000
MEDCOV (H3)	11.1643	38.4869	0.0000	2.0000	5.0000
LNMEDCOV (H3)	1.0587	1.3113	0.0000	0.6931	1.6094
ANALYSTS (H4)	7.4771	6.7651	3.0000	5.0000	10.0000
%INST (H4)	0.4832	0.2731	0.2481	0.4761	0.7184
POST (H5)	0.4595	0.4986	0.0000	0.0000	1.0000
DIFF (control)	0.0386	0.1169	0.0052	0.0182	0.0386

[a] Independent variables are defined as follows:

ΔPF^+ = 1 if the change in pro forma earnings from the same quarter in the prior year is positive, 0 otherwise;
$\Delta GAAP^+$ = 1 if the change in GAAP earnings from the same quarter in the prior year is positive, 0 otherwise;
$\Delta PFHIGH$ = 1 if the change in pro forma earnings from the same quarter in the prior year is greater than the change in GAAP earnings from the same quarter in the prior year, 0 otherwise;
$PF^+\_GAAP^-$ = 1 if pro forma earnings are greater than zero, but GAAP earnings are less than zero;
PRLOSS = 1 if the firm has four consecutive quarters of losses prior to the quarter examined;
STDROA = the standard deviation of ROA (earnings divided by beginning-of-year total assets) over the prior eight quarters;
HITECH = 1 for firms in the following industries, 0 otherwise: Drugs (283), Computer and Office Equipment (357); Electrical Machinery and Equipment, Excluding Computers (360); Electrical Transmissions and Distribution Equipment (361); Electrical Industrial Apparatus (362); Household Appliances (363); Electrical Lighting and Wiring Equipment (364); Household Audio, Video Equipment, Audio Receiving (365); Communication Equipment (366); Electronic Components, Semiconductors (367); Computer Hardware (368); Telephone Communications (481); Computer Programming, Software, Data Processing (737); Research, Development, Testing Services (873);
MEDCOV = number of articles where the firm is mentioned in the headline or lead paragraph in the *Wall Street Journal, USA Today, The New York Times, Time, BusinessWeek, Newsweek, Fortune,* and *Forbes*;
LNMEDCOV = natural log of *MEDCOV*;
ANALYSTS = number of analyst forecasts comprising the end of quarter consensus forecast provided by I/B/E/S;
%INST = percentage of firms outstanding shares owned by institutions reported on Compact Disclosure for the closest calendar quarter to the quarter examined;
POST = 1 if firm-quarter is in 2002, 0 otherwise; and
DIFF = the difference between pro forma and GAAP earnings scaled by total assets.

percent of the sample has positive pro forma earnings and negative GAAP earnings. The level of media coverage varies significantly across firms and is highly skewed. Therefore, for our determinants tests, we use the log of *MEDCOV* (*LNMEDCOV*) as an independent variable. The firms in our sample tend to be well covered by analysts (averaging approximately seven analysts each) and have substantial institutional ownership (48 percent). Finally, as expected, pro forma earnings exceed GAAP earnings on average ($DIFF > 0$).

A correlation matrix of the independent variables is presented in Table 4. Pearson correlations are shown below the diagonal and Spearman (rank) correlations are shown above the diagonal. Several of the independent variables are highly correlated with each other. For example, firms with a history of prior losses have lower institutional ownership ($r = -0.35$) and firms with greater media coverage have greater analyst following ($r = 0.58$). Thus, it is important to test our hypotheses using multivariate analyses.

IV. RESULTS OF DETERMINANTS TESTS

Multivariate Tests of the Determinants of Emphasis (Hypotheses 1–6)

Multivariate tests of Hypotheses 1–6 are based on the following models:[11]

$$\begin{aligned} PFEMP(GAAPEMP, RELEMP) = {} & \beta_0 + \beta_1 PRLOSS + \beta_2 STDROA + \beta_3 HITECH \\ & + \beta_4 \Delta PF^{+}(\Delta GAAP^{+}, \Delta PFHIGH) \\ & + \beta_5 PF^{+}\_GAAP^{-} + \beta_6 MEDCOV \\ & + \beta_7 ANALSYTS + \beta_8 \%INST + \beta_9 POST \\ & + \beta_{10} POST{*}MEDCOV + \beta_{11} DIFF + \varepsilon \qquad (1) \end{aligned}$$

We conduct our analysis using rank regressions (Lang and Lundholm 1996). We convert all nondichotomous variables into ranks and then compute percentile ranks ((rank − 1)/(n − 1)). Using rank regressions does not presume a particular functional form and provides a straightforward interpretation of the coefficients (a percentile change in the independent variable results in a percentile change in the dependent variable).[12] Because we collect six quarters of data for each firm, there is the potential concern that our observations are not independent across time for a given firm, particularly if firms structure their press releases similarly across quarters. If our observations lack independence across time, then the covariances of the residuals for a given firm would be nonzero, which would mean that test statistics based on OLS standard errors would be incorrect. To address independence issues, we base our t-statistics on robust standard errors calculated using the Huber-White estimator (see Huber 1967; White 1982).

Table 5 presents our analysis on the level of pro forma emphasis (*PFEMP*), the level of GAAP emphasis (*GAAPEMP*), and the relative emphasis on pro forma earnings versus

---

[11] Although our hypothesis related to sophisticated users (H4) relates to the level of emphasis on pro forma earnings only, for completeness, we include these proxies in our tests of the level of GAAP emphasis as well as the relative emphasis on pro forma earnings. We obtain similar results if we exclude these variables from our GAAP and relative emphasis regressions.

[12] Another alternative would be to run ordered probit regressions. Results from this analysis are virtually identical to those reported using rank regressions (all variables that are significant in Table 5 continue to be significant at similar probability levels). We choose to present rank regression results for ease of interpretation since ordered probit regressions require the calculation of slope coefficients for each category (in this case, four slope coefficients for the levels regressions and seven for the relative regression) and interpretations of the slope coefficients are ambiguous (except in the case of first and last category). See Greene (1993, 674) for further discussion.

TABLE 4
Correlation Matrix of Dependent and Independent Variables

Variable[a]	*PRLOSS*	*STDROA*	*HITECH*	ΔPF^{+}	$\Delta GAAP^{+}$	$\Delta PFHIGH$	$PF^{+}\_GAAP^{-}$	*LNMEDCOV*	*ANALYSTS*	*%INST*	*DIFF*
PRLOSS	1.00	0.40	0.30	0.16	0.10	−0.09	0.05	0.02	−0.11	−0.36	0.31
		0.00	0.00	0.00	0.00	0.00	0.09	0.54	0.00	0.00	0.00
STDROA	0.20	1.00	0.41	−0.09	0.03	−0.14	−0.12	−0.04	−0.11	−0.43	0.20
	0.00		0.00	0.00	0.28	0.00	0.00	0.19	0.00	0.00	0.00
HITECH	0.29	0.23	1.00	−0.09	−0.05	0.00	−0.07	0.02	0.18	−0.21	0.14
	0.00	0.00		0.00	0.06	1.00	0.02	0.54	0.00	0.00	0.00
ΔPF^{+}	0.11	−0.04	−0.09	1.00	0.52	−0.09	0.00	−0.01	−0.07	0.10	−0.05
	0.01	0.19	0.00		0.00	0.00	0.91	0.64	0.02	0.00	0.08
$\Delta GAAP^{+}$	0.07	0.09	−0.05	0.52	1.00	−0.56	−0.13	−0.02	−0.03	0.07	−0.28
	0.08	0.00	0.06	0.00		0.00	0.00	0.53	0.26	0.02	0.00
$\Delta PFHIGH$	−0.06	−0.12	0.00	−0.09	−0.56	1.00	0.10	0.05	0.08	0.03	0.36
	0.12	0.00	1.00	0.00	0.00		0.00	0.09	0.01	0.23	0.00
$PF^{+}\_GAAP^{-}$	0.04	−0.09	−0.07	0.00	−0.13	0.10	1.00	−0.03	−0.05	0.09	0.26
	0.35	0.00	0.02	0.91	0.00	0.00		0.34	0.09	0.00	0.00
LNMEDCOV	−0.03	0.04	0.04	−0.01	−0.01	0.04	−0.01	1.00	0.46	0.07	−0.01
	0.53	0.20	0.21	0.74	0.68	0.13	0.61		0.00	0.01	0.73
ANALYSTS	−0.10	0.00	0.18	−0.08	−0.01	0.06	−0.03	0.58	1.00	0.41	−0.04
	0.01	0.95	0.00	0.01	0.65	0.03	0.32	0.00		0.00	0.13
%INST	−0.35	−0.22	−0.22	0.11	0.07	0.04	0.09	0.04	0.29	1.00	−0.23
	0.00	0.00	0.00	0.00	0.01	0.19	0.00	0.12	0.00		0.00
DIFF	0.25	0.06	0.10	−0.07	−0.18	0.19	0.07	0.03	0.09	−0.10	1.00
	0.00	0.04	0.00	0.01	0.00	0.00	0.02	0.33	0.00	0.00	

---

[a] Pearson (Spearman) correlation shown below (above) the diagonal; p-values are shown below each correlation coefficient.
Variables are defined in Table 3.

TABLE 5
Determinants of Emphasis on Pro Forma and GAAP Earnings
Tests of H1–H6

	Emphasis on Pro Forma Earnings				Emphasis on GAAP Earnings				Relative Emphasis on Pro Forma Earnings			
Variable[a]	**Pred. Sign**	**Coefficient**	**t-stat**[b]	**p-value**[c]	**Pred. Sign**	**Coefficient**	**t-stat**[b]	**p-value**[c]	**Pred. Sign**	**Coefficient**	**t-stat**[b]	**p-value**[c]
Intercept		0.5391	13.95	0.0001		0.5525	12.81	0.0001		0.4753	11.01	0.0001
PRLOSS (H1)	+	−0.0195	−0.82	0.7924	−	−0.0727	−2.94	**0.0033**	+	0.0474	2.00	**0.0228**
STDROA (H1)	+	−0.1616	−3.62	0.9999	−	0.0689	1.45	0.9265	+	−0.1718	−3.76	0.9999
HITECH (H1)	+	0.0082	0.30	0.3828	−	−0.1021	−3.89	**0.0001**	+	0.0868	3.23	**0.0014**
ΔPF^{+} (H2)	+	0.0517	3.09	**0.0010**								
$\Delta GAAP^{+}$ (H2)					+	0.0398	2.09	**0.0183**				
$\Delta PFHIGH$ (H2)									+	0.0239	1.18	0.1186
$PF^{+}\_GAAP^{-}$ (H2)	+	0.0823	3.25	**0.0006**	−	−0.0306	−1.14	0.1272	+	0.0835	3.21	**0.0014**
LNMEDCOV (H3)	+	0.0594	1.64	**0.0511**	−	−0.0820	−1.85	**0.0324**	+	0.1112	2.61	**0.0046**
ANALYSTS (H4)	+/0	0.0886	1.80	**0.0359**	?	0.0136	0.24	0.8077	?	0.0444	0.83	0.4075
%INST (H4)	+/0	−0.0247	−0.54	0.7041	?	−0.0295	−0.61	0.5417	?	0.0180	0.37	0.7082
POST (H5)	−	−0.0486	−2.18	**0.0149**	+	0.0531	2.15	**0.0161**	−	−0.0734	−3.03	**0.0013**
*POST*MEDCOV* (H6)	−	−0.0120	−0.28	0.3896	+	0.1227	2.50	**0.0063**	−	−0.1081	−2.36	**0.0094**
DIFF	+	−0.0625	−1.77	0.9614	−	−0.0219	−0.55	0.7102	+	−0.0330	−0.78	0.7836
Adjusted R^2			0.093				0.10				0.12	

---

[a] Variables are defined in Table 3.

[b] t-statistics are based on robust standard errors calculated using the Huber-White estimator. Huber-White robust standard errors can be calculated in SAS using Proc Mixed and the Empirical option. See SAS/STAT User's Guide for details.

[c] Reported p-values are one-tailed for variables with a directional prediction and two-tailed otherwise. Bold indicates significant at $p < 0.05$.

GAAP earnings (*RELEMP*). Hypothesis 1 predicts that low value relevance firms will emphasize pro forma earnings and de-emphasize GAAP earnings. Results for two of the three proxies for low value relevance (*PRLOSS* and *HITECH*) support our hypothesis (H1) with respect to the level of emphasis on GAAP earnings—the coefficients are negative and statistically significant, suggesting that firms with a history of prior losses and high-technology firms place less emphasis on GAAP earnings. While none of the coefficients on low value relevance are significant for the *level* of emphasis on pro forma earnings, we do find support for H1 in our *relative* emphasis regression—the coefficient on both *PRLOSS* and *HITECH* are positive and statistically significant, suggesting that firms with a history of prior losses and high-technology firms place greater *relative* emphasis on pro forma earnings.[13]

Because we report rank regressions, the coefficients can be interpreted as follows: firms with a history of prior losses show a 7 percentile decrease in emphasis on GAAP earnings and a 5 percentile increase in relative emphasis on pro forma earnings. Firms in high-technology industries have a 10 percentile decrease in emphasis on GAAP earnings and a 9 percentile increase in relative emphasis. To gauge the economic significance of a percentile shift in the dependent variable, we can consider the case where all four (seven) categories of GAAP (relative) emphasis were of equal size. In this case, a 25 percentile (14 percentile) shift would represent a one-category change. While these effects may not seem large in isolation, when combined with the effects of other independent variables, the overall impact can explain significant shifts in emphasis across firms.

Hypothesis 2 predicts that firms will emphasize metrics in their press release that portray better performance. Consistent with our hypothesis, the coefficients on ΔPF^{+} and $\Delta GAAP^{+}$ in the levels regressions are significant—however, the coefficient on $\Delta PFHIGH$ in the relative emphasis regression is not significant.[14] Also supporting H2, we find a positive and highly significant coefficient on $PF^{+}\_GAAP^{-}$ in the pro forma levels and the relative emphasis regressions. This coefficient is not significant in the GAAP emphasis regression, suggesting that managers are not more likely to de-emphasize GAAP earnings when reporting a pro forma profit and a GAAP loss (although they do place greater *relative* emphasis on pro forma earnings in this case). The magnitudes of the effects of our performance variables range from an 8 percentile shift ($PF^{+}\_GAAP^{-}$ in the pro forma levels regression) to a 2 percentile shift ($\Delta PFHIGH$ in the relative emphasis regression). Together, these results support H2 that firms emphasize a metric if it portrays better firm performance.

---

[13] It is possible that managers of firms with low value relevance of earnings do not view pro forma earnings as the most informative metric. Davis (2002) reports evidence that revenues are value-relevant for Internet firms; therefore, it is possible that some firms emphasize revenues over both pro forma and GAAP earnings. In supplemental untabulated results, we examine the relation between our independent variables and the emphasis placed on revenues within the earnings release. We find a positive coefficient on *HITECH* ($p < 0.001$), indicating that high-technology firms place greater emphasis on revenues in their earnings releases. Thus, consistent with Davis (2002), it appears that firms with low value relevance of earnings de-emphasize earnings metrics in general and instead focus on revenues as the more important metric.

[14] Using continuous earnings variables rather than dichotomous variables (e.g., the change in pro forma [GAAP] earnings scaled by assets in the pro forma [GAAP] level regressions and the difference between the change in pro forma and GAAP earnings in the relative emphasis regression), the significance levels on the coefficients in the pro forma, GAAP, and relative emphasis regressions are 0.02, 0.13, and 0.06, respectively. All other variables have similar significance levels. As discussed previously, we use a dichotomous variable because we believe the incentive to emphasize a particular metric is driven by the sign of the earnings change and not the magnitude—in other words, being able to highlight the fact that earnings increased is more significant than being able to emphasize a 5 percent increase versus a 10 percent increase. Thus, the lower significance levels when using continuous variables are not surprising.

Consistent with H3, the coefficient on media coverage is positive and significant in both the levels and relative pro forma emphasis regressions and negative and significant in the GAAP emphasis regression. The largest effect is in the relative emphasis regression, where a 50 percentile shift in media coverage would result in approximately a 5.5 percentile shift in relative emphasis (i.e., 0.1112 × 0.5).

The coefficient on analyst following is significant in the pro forma regression, lending some support for H4. Firms with greater analyst following appear to emphasize pro forma earnings more, perhaps in response to analysts' demands for this information. However, the coefficient on the institutional ownership variable is not significant. We do not find significance on either of the variables in the GAAP and relative emphasis regressions. We did not predict a relation between the level of sophisticated users and the level of emphasis on GAAP earnings or the relative emphasis on pro forma earnings, but we included these variables in our analysis for completeness.

Our prior descriptive data provide initial evidence of a shift of emphasis following SEC cautionary advice and a proliferation of accounting scandals. These descriptive results suggest a decrease in the net benefits of pro forma reporting in 2002 relative to 2001. However, because there are a number of factors that determine emphasis, it is possible that any change over time is the result of changes in multiple underlying determinants. The inclusion of *POST* in the above regression indicates the extent to which emphasis has changed between the two periods, controlling for other determinants of emphasis, and thus provides a stronger test of H5. Consistent with H5, the coefficient on *POST* is significantly negative in the pro forma level and relative emphasis regressions and significantly positive in the GAAP regression suggesting a decrease in emphasis on pro forma earnings (on an absolute and a relative basis) and an increase in emphasis on GAAP earnings. The coefficients suggest a 5 percentile decrease in pro forma emphasis in 2002, a 5 percentile increase in GAAP emphasis, and a 7 percentile decrease in the relative emphasis on pro forma. Consistent with our univariate results, our evidence indicates that the emphasis firms place on pro forma earnings has decreased between 2001 and 2002, while emphasis placed on GAAP earnings has increased during this time period.

To test whether the change in emphasis is related to concerns over the credibility of accounting disclosures, we examine the coefficient on *POST*MEDCOV*. The coefficient on this interaction variable indicates whether firms subject to greater scrutiny are more likely to change emphasis on pro forma and GAAP earnings in 2002. Consistent with H6, the coefficient on *POST*MEDCOV* is positive and significant in the GAAP regression and negative and significant in the relative emphasis regression. Thus, it appears that firms with greater media coverage are more likely to increase emphasis on GAAP earnings and decrease relative emphasis on pro forma earnings in 2002. However, as indicated by the insignificant coefficient on *POST*MEDCOV* in the pro forma levels regression, we do not find support for our prediction that firms with greater media coverage are more likely to decrease emphasis on pro forma earnings in 2002. Thus, it appears that firms subject to greater scrutiny attempt to increase credibility by increasing emphasis on GAAP earnings but not necessarily by decreasing emphasis on pro forma earnings. For firms that continue to report pro forma earnings, the benefits of emphasizing pro forma earnings still exceed the increased costs associated with emphasizing pro forma in 2002.

Controlling for Firms' Initial Emphasis Decision

Our prior analysis is based on robust standard errors, which address the general concern of potential dependence in our sample data. This dependence would arise if firms follow a consistent disclosure strategy across time.[15] The possibility that managers structure their press releases similarly across quarters also raises the potential concern that a determinant of emphasis present when the firm initially emphasized pro forma earnings (which is not a factor in the quarter we examine) is correlated with one of our hypothesized determinants. Such a factor would represent a correlated omitted variable. To address this concern, we include the emphasis level in the first quarter for which we have data as a proxy for the firm's initial placement decision and re-estimate our model on the remaining five quarters of data. Including the first quarter's emphasis level in our analysis should capture the effects of any determinants that drove the initial placement decision. However, it also potentially weakens our tests to the extent any of our hypothesized determinants also drove the initial placement decision.

The results (untabulated) indicate a coefficient on the initial placement decision variable of 0.41, 0.32, and 0.31 in the pro forma level, GAAP level, and relative emphasis regressions, respectively. These coefficients are highly significant and suggest that a firm's initial disclosure strategy affects the placement of metrics in press releases in subsequent quarters. For example, a 10 percentile increase in the initial level of pro forma emphasis is associated with a 4 percentile increase in future levels of pro forma emphasis.

Despite the significance of the initial placement variable, the results for our main hypotheses after controlling for the initial placement decision are generally consistent with our main analysis with the following exceptions. First, the coefficient on *PRLOSS* is not significant for the level of GAAP emphasis and is only marginally significant ($p = 0.08$) in the relative emphasis regression. Given that the value relevance of earnings is a firm-specific construct (i.e., not expected to vary across quarters for a given firm) and is likely to be a determinant of the initial emphasis decision, it is not surprising that the results for this hypothesis are somewhat weaker. Still, it is possible that some other factor (correlated with our value relevance proxies) drove the initial placement decision and is biasing the results in our main analysis. Second, inconsistent with our main analysis, we find significant coefficients on $PF^{+}\_GAAP^{-}$ in the GAAP emphasis regression and *PFHIGH* in the relative emphasis regression, which provides additional support for our second hypothesis that firms emphasize metrics in their press releases that portray better performance. Finally, the coefficient on *POST* on the level of pro forma emphasis is less significant ($p = 0.085$).

Alternatives Measures of Relative Emphasis

We also tested the sensitivity of our results using two alternative measures of relative emphasis. The first measure, *PFFIRST*, is a dummy variable equal to 1 if pro forma earnings are reported before GAAP earnings, and 0 otherwise. The main advantage of *PFFIRST* is its ability to differentiate emphasis on metrics included in the same paragraph, which would be coded the same under our measure of *RELEMP*. However, *PFFIRST* does not allow for different degrees of relative emphasis, which we believe is an important attribute of a measure of relative emphasis. For example, a firm that reports both pro forma and GAAP earnings in the headline, but with pro forma first, would have the same coding as a firm that reports pro forma in the headline and GAAP in the financial statements only. We believe the latter case represents stronger relative emphasis on pro forma than the first; our measure, *RELEMP*, captures this difference where *PFFIRST* does not.

---

[15] We investigate the extent to which firms use the same level of emphasis across quarters. Across the entire sample period, the proportion of firms with the identical level of pro forma emphasis, GAAP emphasis, and relative emphasis across all six quarters is 19 percent, 19 percent, and 8 percent, respectively. However, within each year (2001 and 2002), the proportion of firms with the same level of emphasis across the three quarters is much higher—ranging from 34 percent to 52 percent. Thus, while the level of emphasis is somewhat stable for many firms within a year, the great majority of firms exhibit variation in their emphasis levels across the two years.

The second measure, *RELEMP2*, is the same as our original measure of relative emphasis (*RELEMP*) unless it equals 0 (i.e., unless GAAP and pro forma earnings are placed in the same paragraph). When *RELEMP* equals 0, *RELEMP2* equals −0.5 if GAAP earnings are reported before pro forma earnings and +0.5 if pro forma earnings are reported before GAAP earnings. *RELEMP2* is a finer measure than *RELEMP* in that it uses positioning within the paragraph to break ties in emphasis inherent in our *RELEMP* measure. However, it is debatable whether differences in position within a paragraph represent managers' real intentions to differentiate between the two metrics, and thus we choose to report *RELEMP* in our main results.

Using *PFFIRST* as the dependent variable (in an untabulated logistic regression) results in a significant coefficient on *PFHIGH* ($p = 0.0004$), while the significance on media coverage and the interaction of media coverage with *POST* become weaker (p-values = 0.11 and 0.08, respectively). The fact that our results are weakened when using the *PFFIRST* variable is not surprising since we lose the variation from larger differences in emphasis. Using *RELEMP2* (in an untabulated rank regression), all variables found to be significant in our main analysis remain significant at similar probability levels and *PFHIGH* is now significant at the 5 percent level.

In conclusion, our results are consistent with managers deliberately emphasizing metrics within the earnings release to focus stakeholder attention on managements' preferred metrics. Our results are inconsistent with press releases being mere boilerplate unrelated to managements' strategic objectives. Further, our results suggest that firms have made a conscious shift in 2002 toward emphasizing earnings on a GAAP, rather than a pro forma basis. We also provide evidence that firms subject to greater scrutiny of their accounting disclosure policies are more likely to voluntarily emphasize GAAP earnings in 2002 (before passage of SEC Reg G) on both an absolute and a relative basis.

V. DOES THE STOCK MARKET REACT TO EMPHASIS?

In this section we provide evidence on the effects of emphasis on stock market reactions to quarterly earnings news. We predict an increasing relation between returns and a particular metric the more that metric is emphasized. In other words, if emphasis matters to investors, then the correlation between stock returns and a particular earnings metric should be greater if more emphasis is placed on that metric (i.e., a positive relation between emphasis and the earnings response coefficient of that metric). This prediction is consistent with managers deliberately emphasizing the more value-relevant metric (H1) and the market efficiently responding to this increased emphasis. Alternatively, it is possible that managers opportunistically use emphasis in an attempt to focus stakeholders' attention on metrics that portray better performance regardless of whether these metrics are more informative. However, if the market recognizes this opportunism, then we would predict no relation between emphasis on a metric and the earnings response coefficient for that metric. As long as some firms are emphasizing the more informative metric, on average, we should find a positive relation between emphasis and the earnings response coefficient. Unless investors conclude that the emphasis decisions of all managers are completely opportunistic, which we believe is unlikely, investors will attach greater weight to the emphasized metric even though they realize the potential for managers to behave opportunistically.[16] Thus, our hypothesis is:

> **H7:** The relation between three-day stock returns and the unexpected realization of an earnings metric is increasing in the level of emphasis placed on the metric, *ceteris paribus*.

Further, the information provided by pro forma earnings that is incremental to the information provided by GAAP earnings should increase when firms place greater emphasis on pro forma earnings. We use the difference between GAAP earnings and pro forma earnings as a measure of the incremental information in pro forma earnings relative to GAAP earnings and refer to this amount as pro forma reconciling items (*RECON*). Thus, we expect a greater correlation between unexpected pro forma reconciling items and stock returns when a firm emphasizes pro forma earnings in its quarterly press releases (both on an absolute basis and relative to its emphasis on GAAP earnings). Likewise, we expect the correlation between unexpected pro forma reconciling items and stock returns to be lower as more emphasis is placed on GAAP earnings. We predict:

> **H8:** The relation between three-day stock returns and the unexpected realization of pro forma reconciling items is increasing in both absolute and relative pro forma emphasis and decreasing in GAAP emphasis, *ceteris paribus*.

Similar to Lougee and Marquardt (2004), we measure unexpected earnings as the seasonally adjusted change in pro forma earnings (UE^{PF}) and GAAP earnings (UE^{GAAP}) as reported in the company's press release, scaled by market value at the beginning of the quarter. Unexpected pro forma reconciling items (*URECON*) equals $UE^{PF} - UE^{GAAP}$. Stock returns (*CAR*) are measured as the three-day (-1 to $+1$) size-adjusted cumulative returns surrounding the earnings announcement date.

We investigate the effect of emphasis on the relation between earnings and returns using a multivariate regression framework. As with our previous analysis, we use rank regressions and convert all nondichotomous variables into percentile ranks. In addition to allowing a more general functional form, this process reduces the effect of outliers. To test H7, we estimate the following two regressions:

$$\begin{aligned} CAR_{it} = {} & \beta_0 + \beta_1 UE_{it}^{PF} + \beta_2 PFEMP_{it} + \beta_3 PFEMP_{it}{*}UE_{it}^{PF} + \beta_4 LOGMV_{it} \\ & + \beta_5 LOGMV_{it}{*}UE_{it}^{PF} + \beta_6 LOSS_{it} + \beta_7 LOSS_{it}{*}UE_{it}^{PF} + \beta_8 POST_{it} \\ & + \beta_9 POST_{it}{*}UE_{it}^{PF} + \varepsilon_{it}; \end{aligned} \tag{2}$$

$$\begin{aligned} CAR_{it} = {} & \beta_0 + \beta_1 UE_{it}^{GAAP} + \beta_2 GAAPEMP_{it} + \beta_3 GAAPEMP_{it}{*}UE_{it}^{GAAP} \\ & + \beta_4 LOGMV_{it} + \beta_5 LOGMV_{it}{*}UE_{it}^{GAAP} + \beta_6 LOSS_{it} + \beta_7 LOSS_{it}{*}UE_{it}^{GAAP} \\ & + \beta_8 POST_{it} + \beta_9 POST_{it}{*}UE_{it}^{GAAP} + \varepsilon_{it}. \end{aligned} \tag{3}$$

---

[16] Even if the emphasis decisions of all managers are completely opportunistic, it is still possible that the earnings response coefficient will increase with the level of emphasis if investors believe other stakeholders are influenced by emphasis, which could result in better terms with suppliers, customers, etc. Moreover, if managers are opportunistic and the market responds (inefficiently) to emphasis, then we would also predict a positive relation between emphasis and the earnings response coefficient.

In both models, β_1 represents the overall earnings response coefficient (ERC) and β_3 captures the change in ERC for different levels of emphasis (H7). Thus, we expect a positive coefficient on β_3. We also include several variables to control for differences in ERCs across firms and across time. *LOGMV* is the log of the market value of equity at the beginning of the quarter and is a proxy for firm size. Prior studies have found lower ERCs for larger firms (see Shevlin and Shores [1993] for a review of these studies) and our determinants results suggest that media coverage, which is likely correlated with firm size, is a determinant of emphasis. Thus, failure to control for firm size could bias our results. We also include *LOSS*, a dummy variable equal to 1 if GAAP earnings for the quarter is negative, and 0 otherwise. Prior research has found lower ERCs for loss firms (e.g., Hayn 1995) and our determinants results also suggest that firms with pro forma profits and GAAP losses emphasize pro forma earnings more and GAAP earnings less. Finally, we control for differences in ERCs across the two years in our sample (*POST* and *POST*UE*) because of potential differences in macroeconomic conditions in the two periods.

Table 6 presents the results for Models 2 and 3 in Panels A and B, respectively. Each panel includes results that exclude the control variables to provide some reference for the effectiveness of the controls, but we discuss the results for the full model. Reported p-values are one-tailed for coefficients with directional predictions and two-tailed otherwise. In the pro forma regression in Panel A, we find a marginally significant positive coefficient on the overall ERC, β_1 ($p = 0.05$) and a significant positive incremental effect based on the level of emphasis, β_3 ($p = 0.04$). Because these are rank regressions, the coefficient of 0.1705 on β_1 indicates that a 100 percentile change in unexpected pro forma earnings leads to a 17 percentile change in three-day stock returns. Similarly, a 100 percentile increase in pro forma emphasis β_3 leads to an *additional* 20 percentile increase in three-day stock returns. Thus, consistent with H7, the results on β_3 suggest that higher levels of emphasis on pro forma earnings lead to larger stock market reactions to pro forma earnings.

In the GAAP earnings regression in Panel B, we find a significant positive coefficient on the overall ERC, β_1, ($p = 0.01$) and a marginally significant positive incremental effect based on the level of emphasis, β_3 ($p = 0.07$). The coefficient of 0.2464 on β_1 indicates that a 100 percentile change in unexpected GAAP earnings leads to a near 25 percentile change in three-day stock returns. Similarly, a 100 percentile increase in GAAP emphasis β_3 leads to an *additional* 17 percentile increase in three-day stock returns. Although somewhat weaker than the pro forma emphasis results in Panel A, the results on β_3 suggest that greater emphasis on GAAP earnings leads to larger stock market reactions to those earnings.

In Figure 2, we depict the effect of emphasizing a particular metric on the relation between that metric and stock returns. The horizontal axis shows two levels of emphasis: "low" (comprised of emphasis levels 3 and 2—in the third paragraph and below in the press release or only in the financial statements); and "high" (comprised of emphasis levels 5 and 4—in the headline, first or second paragraph). We combine emphasis levels to facilitate presentation of the effect and because of the relatively small number of observations in some of the category levels. The vertical axis is the earnings response coefficient on unexpected earnings. Hypothesis 7 predicts an upward sloping relation, i.e., higher emphasis should be associated with a larger ERC. Figure 2 suggests this relation holds, especially for reactions to unexpected pro forma earnings, as the high emphasis ERC (0.30) is almost double the low emphasis ERC (0.17).

To test our hypothesis regarding the incremental information content of pro forma earnings (H8), we run the following regressions:

TABLE 6
Effects of Emphasis on Stock Market Reactions to Pro Forma and GAAP Earnings
Tests of H7

Variable[a]	Predicted Sign	Coefficient	p-value[b]	Coefficient	p-value[b]
Panel A: Rank Regression of Returns on Unexpected Pro Forma Earnings (n = 1188)					
Intercept		0.4830	0.0001	0.4519	0.0001
UE^{PF}	+	0.0062	0.4585	0.1705	*0.0501*
PFEMP	?	−0.0754	0.2730	−0.0709	0.3147
$PFEMP{*}UE^{PF}$ (H7)	+	0.2249	**0.0220**	0.2011	**0.0381**
LOGMV	?			0.0552	0.3923
$LOGMV{*}UE^{PF}$	−			−0.1863	**0.0473**
LOSS	?			0.0070	0.8733
$LOSS{*}UE^{PF}$	−			−0.0599	0.2128
POST	?			0.0136	0.7056
$POST{*}UE^{PF}$	?			−0.0839	0.1709
Adjusted R^2		0.0152		0.0186	
Panel B: Rank Regression of Returns on Unexpected GAAP Earnings (n = 1188)					
Intercept		0.5345	0.0001	0.4428	0.0001
UE^{GAAP}	+	−0.0312	0.6951	0.2464	**0.0149**
GAAPEMP	?	−0.1448	0.0241	−0.1244	*0.0594*
$GAAPEMP{*}UE^{GAAP}$ (H7)	+	0.2268	**0.0221**	0.1727	*0.0688*
LOGMV	?			0.0452	0.4515
$LOGMV{*}UE^{GAAP}$	−			−0.1802	**0.0416**
LOSS	?			0.0748	0.1349
$LOSS{*}UE^{GAAP}$	−			−0.1973	**0.0096**
POST	?			0.0005	0.9891
$POST{*}UE^{GAAP}$	?			−0.0417	0.5089
Adjusted R^2		0.0071		0.0142	

---

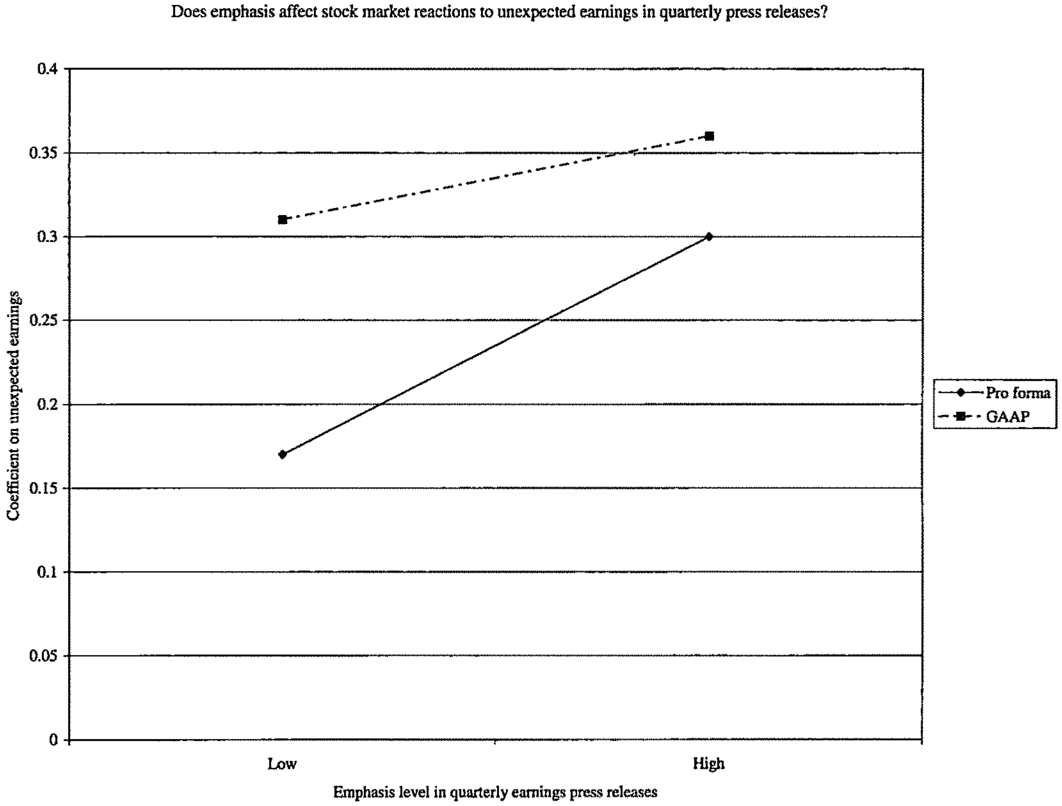
[a] Variables are defined as follows: UE^{PF} (UE^{GAAP}) is the seasonally adjusted change in pro forma (GAAP) earnings as reported in the firm's press release, scaled by market cap as of the beginning of the quarter. *PFEMP* and *GAAPEMP* are defined in Table 2. *LOGMV* is the log of the market value of equity as of the beginning of the quarter. *LOSS* is a dummy variable equal to 1 if GAAP earnings are less than zero, and 0 otherwise. *POST* is a dummy variable equal to 1 if the firm-quarter is in 2002, and 0 otherwise.

[b] Reported p-values are one-tailed for variables with a directional prediction and two-tailed otherwise. Bold (italics) indicates significant at $p < 0.05$ (0.10).

$$\begin{aligned} CAR_{it} = {} & \beta_0 + \beta_1 UE^{GAAP}_{it} + \beta_2 PFEMP(GAAPEMP, RELEMP) \\ & + \beta_3 PFEMP(GAAPEMP, RELEMP){*}UE^{GAAP}_{it} + \beta_4 URECON_{it} \\ & + \beta_5 PFEMP(GAAPEMP, RELEMP){*}URECON_{it} + \beta_6 LOGMV_{it} \\ & + \beta_7 LOGMV_{it}{*}UE^{GAAP}_{it} + \beta_8 LOSS_{it} + \beta_9 LOSS_{it}{*}UE^{GAAP}_{it} + \beta_{10} POST_{it} \\ & + \beta_{11} POST_{it}{*}UE^{GAAP}_{it} + \varepsilon_{it}. \end{aligned} \tag{4}$$

β_1 represents the ERC for GAAP earnings, β_4 represents the incremental response to pro forma earnings, and $\beta_1 + \beta_4$ represents the overall ERC for pro forma earnings. The

FIGURE 2
Stock Market Reactions to Low versus High Levels of Pro Forma and GAAP Earnings Emphasis[a]



[a] The underlying regressions include control variables and are similar to models (3) and (4) except they use a dichotomous emphasis variable, i.e., "high" is the top two emphasis levels (headline, first or second paragraph) and "low" is the bottom two levels (third paragraph or below in the press release or only in the financial statements). Shown above are the coefficient values of β_1 and (β_1 + β_3). In this specification, the coefficient on β_3 is significant at $p < 0.02$ in the pro forma regression but insignificant ($p = 0.20$) in the GAAP regression. This difference is apparent in the significantly greater slope for pro forma versus GAAP emphasis.

main coefficient of interest is β_5, which captures the change in incremental response to pro forma earnings for different levels of absolute and relative emphasis (H8). Thus, we expect a positive coefficient on β_5 when interacted with *PFEMP* and *RELEMP* and a negative coefficient when interacted with *GAAPEMP*.[17]

---

[17] One might expect that we would also predict a negative coefficient on β_3 (the interaction of unexpected GAAP earnings with emphasis) when interacted with *PFEMP* and *RELEMP* and a positive coefficient when interacted with *GAAPEMP*. However, the coefficient on UE^{GAAP} does not capture the incremental information content of GAAP earnings (over pro forma earnings) but rather the full information content of GAAP earnings. Because by definition GAAP earnings are a component of pro forma earnings, we are unable to make predictions on how the information content of this variable will change with changes in emphasis on pro forma and GAAP earnings.

Table 7 presents the results for Model 5. Consistent with our predictions and the results presented in Table 6, we find positive ERCs for both GAAP and pro forma earnings. More importantly, the sign on the interaction between *URECON* and emphasis (β_5) suggests that the information content of unexpected reconciling items varies positively with the level of pro forma emphasis ($\beta_5 > 0$, $p = 0.09$), negatively with the level of GAAP emphasis ($p = 0.09$), and positively with the relative emphasis on pro forma earnings ($p = 0.03$). Overall, our results suggest that the incremental information content of pro forma earnings increases when firms place greater emphasis on pro forma earnings.

VI. CONCLUSION

Until recently, press releases represented one of the least constrained forms of public disclosure of accounting data, providing management the opportunity to frame the presentation of the firm's quarterly earnings as they saw fit relatively unfettered by industry guidelines or SEC regulations. However, recent accounting scandals heightened public scrutiny of accounting disclosures and prompted the SEC (2002) to pass Regulation G, which established guidelines for reporting non-GAAP metrics, including pro forma earnings. Regulator and media attention to this issue stems from the concern that managers present accounting data in a way that could potentially mislead the firms' stakeholders. To explore

TABLE 7

Effects of Emphasis on the Incremental Information Content of Pro Forma Earnings

Tests of H8 (n = 1188)

		PFEMP			***GAAPEMP***			***RELEMP***	
Variable[a]		**Coefficient**	**p-value**[b]		**Coefficient**	**p-value**[b]		**Coefficient**	**p-value**[b]
Intercept		0.3996	0.0001		0.2532	0.0258		0.3907	0.0001
UE^{GAAP}	+	0.2537	**0.0227**	+	0.4037	**0.0019**	+	0.3092	**0.0051**
PFEMP		−0.2002	0.2173						
GAAPEMP					0.1020	0.5527			
RELEMP								−0.1829	0.2561
$PFEMP*UE^{GAAP}$		0.2549	0.1284						
$GAAPEMP*UE^{GAAP}$					−0.0317	0.8611			
$RELEMP*UE^{GAAP}$								0.1663	0.3226
URECON	+	−0.0085	0.5372	+	0.2236	**0.0150**	+	−0.0487	0.2969
*PFEMP*URECON*	+	0.2238	*0.0873*						
*GAAPEMP*URECON*				−	−0.2447	*0.0854*			
*RELEMP*URECON*							+	0.3091	**0.0325**
LOGMV		0.0360	0.5531		0.0234	0.6998		0.0142	0.8161
$LOGMV*UE^{GAAP}$	−	−0.1564	*0.0688*	−	−0.1423	*0.0875*	−	−0.1306	0.1083
LOSS		0.0792	0.1116		0.0704	0.1604		0.0789	0.1127
$LOSS*UE^{GAAP}$	−	−0.1931	**0.0100**	−	−0.1915	**0.0119**	−	−0.2068	**0.0064**
POST		−0.0173	0.6358		−0.0031	0.9331		−0.0059	0.8735
$POST*UE^{GAAP}$		−0.0079	0.8992		−0.0331	0.6012		−0.0238	0.7084
Adjusted R^2		0.0173			0.0178			0.0193	

---

[a] Variables are defined in Tables 2 and 6 except for *URECON*, which is $UE^{PF} - UE^{GAAP}$.

[b] Reported p-values are one-tailed for variables with a directional prediction and two-tailed otherwise. Bold (italics) indicates significant at $p < 0.05$ (0.10).

the use of emphasis as a disclosure tool and to address the debate on the presentation of pro forma reporting, we first examine the determinants of emphasis placed on pro forma and GAAP earnings within quarterly earnings press releases.

Our evidence suggests that firms with low value relevance of earnings place less emphasis on traditional GAAP earnings and greater relative emphasis on pro forma earnings. However, inconsistent with our predictions, these firms do not appear to be placing a greater *level* of emphasis on pro forma earnings. Consistent with our predictions, we find that managers emphasize the metric that portrays better firm performance. We also find that firms with greater media exposure place greater emphasis on pro forma earnings and less emphasis on GAAP earnings, which is consistent with the notion that accessibility of a firm's press release by individual stakeholders influences managers' choice to emphasize pro forma metrics. Finally, our results indicate that firms have reduced their emphasis on pro forma earnings and increased their emphasis on GAAP earnings in 2002 compared to 2001—especially those subject to greater media exposure. These results are consistent with managers perceiving a decline in the net benefit of reporting pro forma earnings subsequent to SEC cautionary guidance in December 2001 and the exposure of high profile accounting scandals beginning in late 2001 and continuing in 2002.

We also provide evidence on the effects of emphasizing metrics in a press release. We find that the stock market response to pro forma earnings is greater with higher levels of emphasis. Further, the incremental information content of pro forma earnings increases as the relative emphasis on pro forma increases.

Taken together, our results suggest that managers used the latitude allowed in composing press releases to meet their corporate reporting objectives, including emphasizing metrics that are more value-relevant, "marketing" their firm's performance by emphasizing metrics that portray "better" firm performance, and responding to changes in the market sentiment regarding the acceptability of certain reporting practices. Further, the results from our stock market tests suggest that equity market participants are affected by managers' emphasis decisions. This result, in turn suggests that other non-investor stakeholder groups may also be affected by emphasis.

By examining emphasis as a disclosure tool, this study contributes to our understanding of the disclosure mechanisms managers use to influence stakeholders' perceptions of accounting data. Our evidence of an association between managers' strategic objectives and the emphasis placed on alternative earnings metrics in quarterly press releases, suggests that managers view emphasis as another mechanism to influence stakeholders' perceptions. This study also contributes to the debate over pro forma earnings. Our finding that firms decreased emphasis on pro forma earnings following SEC cautions and recent accounting scandals is consistent with stakeholders viewing pro forma reporting as potentially opportunistic behavior and managers responding to this credibility concern by decreasing emphasis on this metric.

REFERENCES

Aerts, W. 2001. Inertia in the attributional content of annual accounting narratives. *The European Accounting Review* 10 (1): 3–32.

Bettman, J., and B. Weitz. 1983. Attributions in the boardroom: Causal reasoning in corporate annual reports. *Administrative Science Quarterly* 28: 165–183.

Bhattacharya, N., E. Black, T. Christensen, and C. Larson. 2003. Assessing the relative informativeness and permanence of pro form earnings and GAAP operating earnings. *Journal of Accounting and Economics* 36 (1–3): 285–319.

Bloomfield, R. 2002. The "incomplete revelation hypothesis" and financial reporting. *Accounting Horizons* 16 (3): 233–243.

Bradshaw, M., and R. Sloan. 2002. GAAP versus the Street: An empirical assessment of two alternative definitions of earnings. *Journal of Accounting Research* 40 (1): 41–66.

Burgstahler, D., and I. Dichev. 1997. Earnings management to avoid earnings decreases and losses. *Journal of Accounting and Economics* 24 (1): 99–126.

CFO.com. 2001. Money managers say pro forma results are useful. (November 8).

Collins, D., E. Maydew, and I. Weiss. 1997. Changes in the value relevance of earnings and book values over the past forty years. *Journal of Accounting and Economics* 24 (1): 39–68.

———, M. Pincus, and H. Xie. 1999. Equity valuation and negative earnings: The role of book value of equity. *The Accounting Review* 74 (1): 29–61.

Chen, S., M. DeFond, and C. Park. 2002. Voluntary disclosure of balance sheet information in quarterly earnings announcements. *Journal of Accounting and Economics* 33: 229–251.

Davis, A. 2002. The value relevance of revenue for Internet firms: Does reporting grossed-up or barter revenue make a difference? *Journal of Accounting Research* 40 (2): 445–477.

Elliott, W. B. 2005. Are investors influenced by pro forma emphasis and reconciliations in earnings announcements? *The Accounting Review* (forthcoming).

Francis, J., and K. Schipper. 1999. Have financial statements lost their relevance? *Journal of Accounting Research* 37 (2): 319–352.

———, ———, and L. Vincent. 2003. The relative and incremental explanatory power of earnings and alternative (to earnings) performance measures for returns. *Contemporary Accounting Research* 20 (1): 121–165.

Franzen, L. 2002. The nature of losses and value relevance of earnings. Working paper, The University of Texas at Dallas.

Gibbins, M., A. Richardson, and J. Waterhouse. 1990. The management of corporate financial disclosure: Opportunism, ritualism, policies and processes. *Journal of Accounting Research* 28 (1): 121–143.

Graham J., C. Harvey, and S. Rajgopal. 2005. The economic implications of corporate financial reporting. *Journal of Accounting and Economics* (forthcoming).

Greene, W. H. 1993. *Econometric Analysis.* New York, NY: Macmillan Publishing Company.

Hayn, C. 1995. The information content of losses. *Journal of Accounting and Economics* 20: 125–153.

Huber, P. 1967. The behavior of maximum likelihood estimates under nonstandard conditions. In *Procedures of the Fifth Annual Berkeley Symposium on Mathematical Statistics and Probability*, Volume 1, edited by L. M. LeCam, and J. Neyman, 221–233. Berkeley, CA: University of California Press.

Investor Relations Business. 2001. Pro forma earnings advice needed: Companies want to value stock appropriately in their releases. (November 26).

Lang, M., and R. Lundholm. 1996. Corporate disclosure policy and analyst behavior. *The Accounting Review* 71 (4): 467–492.

Lev, B., and P. Zarowin. 1999. The boundaries of financial reporting and how to extend them. *Journal of Accounting Research* 37 (2): 353–385.

Lougee, B., and C. Marquardt. 2004. Earnings informativeness and strategic disclosure: An empirical examination of "pro forma" earnings. *The Accounting Review* 79 (3): 769–795.

National Investor Relations Institute (NIRI). 2001. Earnings press release guidance. April 26. Vienna, VA.

———. 2002. NIRI guidelines to improve earnings releases. October 8. Vienna, VA.

Schrand, C., and B. Walther. 2000. Strategic benchmarks in earnings announcements: The selective disclosure of prior-period earnings components. *The Accounting Review* 75 (2): 151–177.

Securities and Exchange Commission (SEC). 2001. Cautionary advice regarding the use of "pro-forma" financial information in earnings releases. Release Nos. 33-8039, 34-45124, FR-59, December 4. Available at: http://www.sec.gov/rules/other/33-8039.htm.

———. 2002. Proposed rule: Conditions for the use of non-GAAP financial measures. Release No. 33-8145. November 5. Available at: http://www.sec.gov/rules/proposed/33-8145.htm.

Shevlin, T., and D. Shores. 1993. Firm size, security returns, and unexpected earnings: The anomalous signed-size effect. *Contemporary Accounting Research* 10 (1): 1–30.

Tasker, S. 1998. Bridging the information gap: Quarterly conference calls as a medium for voluntary disclosure. *Review of Accounting Studies* 3: 137–167.

Wall Street Journal. 2001. SEC threatens to sue companies for misleading pro-forma results. (December 5): A2.

White, H. 1982. Maximum likelihood estimation of misspecified models. *Econometrica* (50): 1–25.

THE ACCOUNTING REVIEW
Vol. 80, No. 4
2005
pp. 1039–1068

Management Accounting Systems Adoption Decisions: Evidence and Performance Implications from Early-Stage/Startup Companies

Antonio Davila
George Foster
Stanford University

ABSTRACT: Adopting management accounting systems are important events in the life of young and growing companies. Using a sample of 78 startup companies, we document cross-sectional differences in the adoption of operating budgets as well as seven other management accounting systems. We find that our proxies for agency costs, perceived benefits and costs, company scale, and top management style explain cross-sectional differences in the time-to-adoption of budgets. In particular, the presence of venture capital, CEO experience, presence of a financial manager, number of employees, and the CEO beliefs about management planning systems are associated with this adoption decision. We further investigate the effect of hiring a financial manager as an endogenous variable. In the first stage of a two-stage model, we find that CEO experience, the presence of venture capital funds, CEO beliefs about management accounting systems, and number of employees are associated with cross-sectional variation in this hiring decision. When treating this decision as endogenous, time-to-hiring a financial manager is unrelated to operating budget adoption. The paper also examines the association between the time-to-adoption of operating budgets and company performance. We find a significant increase in the number of employees of the company around the adoption of operating budgets; moreover, faster adoption of operating budgets is associated with faster growing companies. We extend the findings to additional management accounting systems including: cash budgets, variance analysis, operating expense approval policies, capital expenditure approval policies, product profitability, customer profitability, and customer acquisition costs. The influence of industry (biotechnology, information technology, or non-tech) is examined in each stage of the research.

This paper was funded by the Center for Entrepreneurial Studies (CES), Graduate School of Business.
We greatly appreciate the support of CES co-directors Professors Irv Grousbeck and Charles Holloway and CES program directors Mary Burnham and Linda Wells. We also appreciate the comments from the anonymous reviewers, Philip Brown, John Hand, Mark Young, and participants at the Stanford Accounting Summer Camp and University of Sydney seminar. We are also very grateful for the support of the people who assisted us on this project: Jennifer van Steele, Mu Li, Aimee Noelle Swanson, Christopher Armstrong, Jan Chong, Merle Ederhof, Jakub Wilsz, and Ravi Sarin. John Gabbert of VentureOne helped greatly.

Editor's note: This paper was accepted by Terry Shevlin, Senior Editor.

Submitted October 2004
Accepted May 2005

I. INTRODUCTION

Accounting systems' adoption is an important thrust of accounting research. It has been a central topic in research on both external financial reporting[1] and management accounting systems (MAS). Recently, the adoption of MAS in younger firms has begun to receive attention (Moores and Yuen 2001; Davila 2005; Sandino 2005). At the startup phase of a company, there is very little architecture of any kind "in place." Decisions made about product focus, customer focus, technology focus, employees, partners, etc., help build up the operational framework of a company. Decisions made about the adoption of budgets, product profitability analysis, variance analysis, etc., build up the MAS part of this operational framework.

The research in this paper examines 78 startup companies from their genesis. Field research data are collected using a multi-method, multi-case research design. We analyze the adoption of MAS as these companies deploy their product focus, customer focus, and other operational areas. Most prior MAS research on adoption decisions and their performance implications focuses on decisions to refine or replace existing parts of established systems. Section II provides an overview of prior and concurrent research in this area.

We define MAS as a subset of management control systems (MCS)—interpreted as "formal, information-based routines and procedures managers use to maintain or alter patterns in organizational activities" (Simons 1995, 5)—that focus on the financial aspects of the company. Thus, we interpret them as a recurring and formalized set of institutionalized protocols, routines, or information gathering mechanisms designed to assist managers make decisions or fulfill their responsibilities. Within MAS, budgeting systems have a long research tradition. Much of this research has examined budgeting in established companies. In contrast, there is minimal research on budgeting practices in early-stage companies. We find that budgets are the earliest system adopted in our sample of startup firms.

This paper makes three contributions to the literature. First, we examine hypotheses about the cross-sectional variation in the timing of adoption of MAS in startups, with specific reference to operating budgets and seven other MAS components: cash budgets, variance analysis, operating expense approval policies, capital expenditure approval policies, product profitability, customer profitability, and customer acquisition costs. All these components typically fall within management accounting, broadly defined. Second, we report evidence on the association between operating budgets adoption and various measures of company performance (valuation, revenues, and headcount). Third, we present descriptive statistics on the decisions by these 78 startup companies to adopt various management accounting systems. The use of startup companies enables us to capture differences in the timing of adoption of these individual systems; a sample of established companies likely would already have the majority of these systems adopted.

We find that the presence of external investors—venture capitalists—is associated with faster adoption of operating budgets. The scale of the company—as proxied by number of employees—is related to faster adoption. CEO experience and CEO beliefs about the benefits of planning are also related to faster adoption. The hiring of a financial manager is also associated with this adoption decision. This is consistent with the "import-in" notion of management accounting system evolution wherein firms acquire new systems with newly appointed managers as a "bundled pair." However, when this hiring decision is modeled as endogenous, we find that companies with venture capital funding, CEOs with more years of work experience, CEO beliefs about MAS that values planning, and larger companies are more likely to hire this bundled "new manager/new accounting system" pairing sooner.

---

[1] There is now an extensive set of published work in the external financial reporting area. Ball and Foster (1982) reference the literature up to 1982. For more current reviews, see Fields et al. (2001), Healy and Palepu (2001), Holthausen and Watts (2001).

Finally, the paper documents an association between the adoption of operating budgets and company performance. We find a significant increase in the growth of the company in the window around the adoption year. Furthermore, companies' adoption of operating budgets is associated with their future growth.

The paper is structured as follows. The next section reviews the literature relevant to the paper. Section III develops the predictions that guide the empirical work. Section IV describes the research design. Section V presents the findings and Section VI concludes.

II. RESEARCH LITERATURE

Two main lines of research in the MAS literature relate to this paper. One thrust examines adoption decisions and their performance implications in (1) startup firms, and (2) established companies. The second research thrust is the budgeting literature.

Management Accounting Systems Adoption in Startup Companies

It is only in recent years that management accounting research has developed a focus on startup companies. Granlund and Taipaleenmaki (2005) study the role of management accounting systems in eight New Economy Firms. They find that the unique setting that these firms face—fast growth, management attention absorbed away from the accounting function, and external influences such as venture capitalists—leads to important differences in how these systems are used. Budgeting is the accounting system that is first used, while advanced accounting systems are present only in firms with strong beliefs about their future success. Cost accounting, customer profitability, long-term financial planning, and capital budgeting have little, if any, presence. Short-term planning gets all the attention, at the expense of follow-up control. These authors also highlight the relevance of venture capitalists in the development of management accounting systems. Sandino (2005, 1) examines the build up of management control systems (MCS) using a questionnaire in a sample of 97 "young U.S. retailers in an early stage of their growth." The average age was 13.27 years (compared to 5.47 years in this research). Most early stage firms were reported to introduce "two sets of systems." The first, which she labels as "Basic MCS," was introduced by most firms first and included budgets, pricing systems, and inventory control. Sandino's (2005) research focused on the differing subcomponents of a second set of MCS. Companies that emphasize cost leadership in their strategy were more likely to add "a set of managerial controls focused on enhancing operating efficiencies, minimizing costs ..." (Sandino 2005, 1). Companies that emphasize product differentiation were more likely to add "a more flexible set of controls, focused on gathering nonfinancial information and responding to customers" (Sandino 2005, 1). Our research complements this work in the analysis of differences across companies in the timing of adoption of individual components of the "Basic MCS" set, and its performance implications.

Moores and Yuen (2001) include analysis of early-stage companies as part of their cross-sectional analysis of MAS's structure over the life-cycle of firms. They classify their sample of 49 companies in the Australian clothing and footwear industry into five categories—birth (2 companies), growth (6), maturity (29), revival (5), and decline (9). The two birth firms were reported to be below the 49-company average in terms of their average reliance on 13 management systems (such as cash flow statements, participative budget control, and responsibility accounting). Their analysis supported the hypothesis that "MAS formality (in terms of selection and presentation of information) across organizational life-cycle stages will increase from birth to growth." They did not attempt to probe MAS adoption variation.

Finally, Davila (2005) examines the adoption of MCS in the human resource function of startup firms. The sample is 95 technology-oriented firms in California's Silicon Valley. He finds that the presence of venture capital, company size, and founder replacement as CEO are associated with the speed of adoption of these systems.

Management Accounting Systems' Adoption in Established Companies

There is a sizable literature that examines adoption and performance implications of specific MAS "innovations." The samples examined are typically established companies that already have a system and are making a refine/replace system decision. "Innovations" that have attracted most research attention include activity-based costing (ABC), strategic performance measures, and total quality management (TQM).[2] Most of this literature takes a functionalist approach where the adoption decision is assumed to depend on cost-benefit considerations. However, alternative explanations for these decisions have been proposed. For example, new institutionalism argues that "innovations" are adopted to conform to socially accepted practices (Powell and DiMaggio 1991; Baxter and Chua 2003). "Innovations" can also emerge as a symbol to legitimize organizational positions (Ahrens and Chapman 2002).

Activity-Based Costing (ABC)

The ABC "innovation" emerged in the late 1980s. The relatively quick adoption of ABC by a subset of companies provided "field study" opportunities for multiple research studies. For example, Cagwin and Bouwman (2002) use survey data from 204 companies, 47 of which identified themselves as "significant users of ABC" and 18 were "in the implementation phase." They report a "positive association between ABC and improvement in ROI when ABC is used concurrently with other strategic initiatives, when implemented in complex and diverse firms, [and] when used in environments where costs are relatively important" (Cagwin and Bouwman 2002, 1). Other related research papers on ABC adoption and performance implications include Shields (1995), Foster and Swenson (1997), Anderson and Young (1999), Anderson et al. (2002), and Ittner et al. (2002).

Strategic Performance Measures

Performance measures have been criticized for being either too short-run focused or having excessive reliance on financial variables. Proposals to refine or replace existing performance measures have come under multiple labels (balanced scorecard, economic value measures, and strategic performance measures). Research on the "impact" of these new systems came after a subset of companies adopted them. Ittner et al. (2003) exemplify this research. They examine a sample of 140 U.S. financial service firms and report that "firms making more extensive use of a broader set of financial and (particularly) nonfinancial measures than firms with similar strategies or value drivers have higher measurement system satisfaction and stock returns" (Ittner et al. 2003, 715).[3]

---

[2] These three are illustrative. The first two relate to MAS. TQM falls under the MCS umbrella. Another example in MAS is customer profitability analysis (see, for example, Guilding and McManus 2002). Other examples in MCS include JIT, business re-engineering, and supply chain analysis.

[3] See Ittner and Larcker (2001) for a review of this line of research.

Total Quality Management (TQM)

Starting in the early 1980s, there was increasing advocacy for companies to adopt TQM. A line of research emerged around TQM adoption decisions and its economic effects. Barron and Gjerde's (1996) work is illustrative. They identified 6.6 percent of U.S. companies (of 2,297 Compustat companies) as having adopted TQM. TQM was found to be more likely adopted by larger companies, with lower employee turnover, and "less in-house production of output by labor" (Barron and Gjerde 1996, 96). They also report that "firms adopting TQM experience greater growth in sales, employment, and capital stock" (Barron and Gjerde 1996, 69). Easton and Jarrell (1998) study the performance of "108 firms that began TQM implementation between 1981 and 1991" vis-à-vis a control sample. They report that "performance, measured by both accounting variables and stock returns, is improved for the firms adopting TQM" (Easton and Jarrell 1998, 253).

Budgeting Decisions and Their Performance Consequences

Budgeting has occupied center stage of management accounting research for many years. Reviews of the management accounting literature invariably give broad coverage to budgeting—see, for example, Brownell (1995), Bonner et al. (2000), Covaleski et al. (2003), Luft and Shields (2003, especially Appendices A and B), and Shields (2005). Most empirical research examines budgeting issues for established companies, e.g., factors affecting the decision to adopt participative budgeting and its performance implications. Chenhall (2003, 148), in a review of over 40 contingency-based MCS studies, notes that "studies have examined relatively large organizations, usually justifying this as it is large firms that tend to adopt the types of practices incorporated within more formal MCS."

III. PREDICTIONS ON THE ADOPTION OF MANAGEMENT ACCOUNTING SYSTEMS

MAS play two main roles: reducing agency costs, and facilitating decision making (Baiman 1982). First, they reduce the agency costs associated with the separation of ownership and control. One approach to examine their relevance is to focus on the contracting process between principal and agent. Previous research in larger companies has examined the role of accounting information in the contracting process with managers. In particular, accounting performance measures have been shown to be relevant over and above other potential measures of performance such as market-based measures (Sloan 1993) or nonfinancial measures (Ittner et al. 1997).

An alternative is for management accounting systems to reduce agency costs through effective monitoring. In entrepreneurial companies, where incentive mechanisms rely heavily on stock ownership, management accounting information can potentially play a significant role in monitoring performance by shareholders. Venture capital is an important source of financing for growth startup companies; the introduction of outside funding gives rise to agency costs. Prior to the first venture capital investor, founders-managers control a significant amount of the equity. Other potential additional investors are often "friends and family" who rely on informal mechanisms to align incentives. Thus, the entry of venture capital effectively becomes the first time when there is a separation between ownership and control that requires formal monitoring. This separation is associated with agency costs as highlighted in entrepreneurship (Sapienza and Gupta 1994) and entrepreneurial finance studies (Admati and Pfleiderer 1994; Bergemann and Hege 1998). In order to enhance the monitoring of startup performance, venture capitalists may encourage the use of management accounting systems. This "encouragement" is part of a broader package of professionalization benefits (over and above financing) that venture capitalists bring to early-stage companies (see, Hellman and Puri 2002). Therefore, we expect the presence of venture capital is associated with faster adoption of MAS.

Second, MAS also fulfill a decision-making role (Baiman 1982). Managers need information to update their beliefs about the consequences of their decisions. Information for belief updating comes in very different forms such as qualitative, nonfinancial, and financial information. Information-processing models in organizational theory (Tushman and Nadler 1978) credit MAS as being a relevant source of managerial information. The concept of interactive systems (Simons 1995) relies on accounting information as the basis for learning exempt of any evaluation purpose. Entrepreneurial companies face dynamic settings that put a premium on timely belief updating. The need for management accounting information increases with the scale of the company (Moores and Yuen 2001). In the early stages of a company, informal interactions are enough to fulfill the information needs. As it grows, the increased scale requires information infrastructure to deal with these needs.

One manifestation of scale is an increase in headcount. As the number of employees increases, interactions are required to increase exponentially. For n employees the number of potential communication channels among these people is $n^*(n - 1)/2$. Maintaining these one-to-one informal interactions becomes costly and MAS formalize communication and decrease these costs. Thus, we expect a higher number of employees to be associated with faster adoption of MAS.

Increases in the scale of activities can also arise through geographic expansion. One major example is international expansion, which presents significant additional challenges such as different cultures, legal systems, business practices, and even languages (Groot and Merchant 2000). Management accounting systems may facilitate the information needs associated with international operations. We expect the presence of international operations to be associated with faster adoption of MAS.[4]

The adoption of management accounting systems requires an evaluation of their costs and benefits. The literature on MAS adoption discussed in Section II is often based on these arguments. For instance, companies with more complex operations (either in product or process diversity) are predicted to adopt ABC sooner because they expect to have a more favorable cost-benefit relationship. In the startup environment, cost-benefit analysis is also likely to be relevant. We examine two potential variables that can shift the cost-benefit relationship. First, if the design and maintenance of management accounting systems require costly knowledge, then the hiring of a manager knowledgeable of these systems decreases these costs and accelerates their adoption. Moreover, the presence of a manager with specific knowledge about accounting systems enhances the perceived benefits of adoption. Second, because the benefits from MAS are intangible and difficult to evaluate, previous experience enhances the likelihood of having been exposed to them and the assessment of their benefits. Because of the paramount influence that the CEO has on the organization of startup firms and his/her decisions affect how financial managers in particular allocate their effort, we focus on the experience of the CEO as a potential variable that reflects cost-benefit beliefs.[5] Therefore, we expect the hiring of a financial manager and CEO experience to be associated with faster adoption of MAS.

---

[4] The two aspects of organizational scale can also be interpreted as increased complexity. However, this latter concept is much broader and encompasses dimensions beyond scale.

[5] Ideally, the type of experience is a more attractive variable than number of years, which is a cruder measure of cost-benefit knowledge. For the current CEO we collected detailed information on type of experience during the interview; however such detailed information was not available for former CEOs because most of them were not employed at the time we interacted with the firms.

Previous research has documented top management (CEO) beliefs as a key variable in systems choice. Baron et al. (1999) provide compelling evidence that the beliefs of a company's leaders (founder and CEO)—what the authors call the leader's "employment model"—significantly affect the human resource policies of the company. We extend this prediction to the adoption of MAS in entrepreneurial firms. In particular, we examine how CEO beliefs toward planning influence the timing and content of MAS components.

Finally, the entrepreneurship literature has frequently flagged the replacement of the founder as CEO as a common event in these types of firms (Willard et al. 1992). The argument is based on the psychological characteristics of entrepreneurs. While they enjoy the fluidity of new ventures, they fail to put in place the management tools required to grow the company. Greiner (1998, 61) describes it as "[founders] are probably unsuited to be managers." This proposition suggests that management accounting systems are more likely to be chosen when a professional manager replaces the founder as CEO.

IV. EMPIRICAL METHODS

Description of the Sample

We build our sample of startup companies using the following selection criteria at the time of sampling (January and June 2002): (1) minimum of 50 and maximum of 150 employees, (2) less than ten years old, (3) independent, and (4) in a limited geographic area.[6] Prior to the design of the study, we met with five chief financial officers of startup companies (several with multiple startups) to describe the objectives of the study; the discussion indicated that smaller companies rely on informal mechanisms to a very large extent. This observation led to our minimum firm size of 50 in sample year requirement. Once admitted into our sample, we go back to the genesis of these companies and track the buildup from the initial team (which is often less than 10 employees). Our sample includes companies with more than 150 employees in two ways. Some firms with less than 150 employees at the time of sampling had more in prior periods. We also have data through to December 2003 for some companies. Growing companies with less than 150 employees at the time of sampling can exceed this level subsequent to 2002. Thus, our research covers the growth of systems as our sample firms grow from a single-digit number of employees to between 50 and 150 employees (and in some cases beyond 150). The age criterion of less than ten years old samples companies for which it is most likely that people familiar with accounting adoption decisions will still be at the company. We did not restrict companies to be private-, domestic-, or venture-funded; however, the majority of companies were private-, domestic-, and venture-funded.

Our sample includes high-technology and non-technology companies. Within the high-technology sector, we oversample biotechnology companies to collect a large enough sample of companies in an increasingly important sector. The population of high-tech companies was sourced from the CorpTech Directory of High Technology Companies. We accessed the database in January and June 2002 to build our sample from the following industries (using CorpTech industry classification): biotech (BIO), computer hardware (COM), manufacturing (MAN), medical equipment (MED), pharmaceuticals (PHA), photonics (PHO), computer software (SOF), subassemblies (SUB), test and measuring equipment (TAM), and telecommunications (TEL).[7] The biotechnology subsample was extended using three additional databases particular to the industry: *Rich's High-Tech Business Guide to Silicon Valley and Northern California* (2000/2002), BioScan (October 2001), and the U.S. Business Browser (2001), and by expanding the geographical criterion. We also sampled non-tech companies from CorpTech's non-tech listings and from the venture-backed firms' database PwC MoneyTree accessed in January 2003.

---

[6] The main reason for the geographic criterion was research funding (more than 50 percent of the companies were visited on-site).

[7] We excluded from these lists any companies that were also listed as "Energy," "Environment," "Chemical," "Defense," or "Transportation." The "Non" category was used to sample non-tech companies.

We sent a letter to the CEO of every company in the sampled population. The letter described the purpose of the research, the research process, as well as the benefits of participating. We followed up the letter with a phone call to entice participation; a company was dropped from the sample if it had not accepted or declined participation after five phone calls. Table 1 documents the sample selection process. Excluding those companies that did not meet the sampling criteria, the response rate is 19 percent.[8] We compared participating and nonparticipating companies in terms of size and age. We found no significant differences between these two populations.[9] The final sample includes 78 startup companies.

Research Method

We adopt a multi-method, multi-case field research design. Management accounting systems' adoption information is not readily available from public sources. Thus, studying them required developing tailored research instruments to develop the database. The multi-method design relies on qualitative and quantitative data. In particular, our data includes questionnaire and semi-structured interviews. A multi-method design enriches the survey-based data with detailed information about the use of management accounting systems and facilitates triangulation (Jick 1979). Rich description of each company's history also provides the context to understand why systems were adopted. During the interviews, respondents were not asked directly about "intangible" variables such as company culture or sources of competitive advantage that may vary depending on the reference point of each respondent and may entice respondents to bias their answer to "acceptable practices." Rather, we infer them from the actors' descriptions of their experiences (Seidman 1998).

TABLE 1
Sample Construction

Companies in the initial database	624
Minus	
Companies that went out of business	94
Companies acquired	88
Companies ineligible in some other way[a]	41
Companies that did not respond[b]	188
Companies that declined participation	135
Final sample of companies	78

[a] These are companies that are too small, too old, or subsidiaries of other companies.
[b] These are companies that did not respond to the five telephone contacts.

---

[8] This response rate assumes that all companies that did not respond were eligible.

[9] We compared means and medians of sales, employees, and age of our sample and the sample of companies that did not participate but were eligible. These three data items were available (often "estimates" only) on the commercial (public) databases we used in our selection procedures.

We chose a multi-case field design to gather a large enough sample to go beyond company-specific experiences and examine the generalizability of the findings through statistical validation.

For each company we collected as much information from public sources as possible—such as company's web pages and press releases from Lexis-Nexis. We used this information to familiarize the research team with the characteristics and products of each company before the actual data collection. Next, each company received three questionnaires—one for the CEO, another for the CFO, and a third one for the business development/marketing manager. The purpose of the questionnaire was to collect quantifiable information that was later triangulated during the interview process. The final phase of the data collection included semi-structured interviews with each of the three managers. Each interview lasted approximately one hour and relied on a detailed protocol listing the questions to be addressed. The protocol insured that the main topics of the research were systematically covered during the conversation. The semi-structured nature of the interview gave the flexibility of follow-up questions to clarify the particular practices at each company (Marshall and Rossman 1995). We conducted the interviews in person or by phone and at least two researchers were present in every interview to insure that all the relevant topics were adequately covered and to query the interviewer when clarification of a certain topic was required. Interviews were taped and then transcribed. The questionnaire, sent prior to the interview, facilitated focusing the interview around the key aspects of interest. The interview was also instrumental in clarifying answers to the questionnaire.

Interviews and questionnaires have certain limitations that affect our research design. In particular, there is no guarantee that the description from the interviews corresponds to reality. Respondents may be subject to recall bias and their particular interpretation of the history of the company. We mitigate this limitation by asking several respondents, asking about various dimensions of the variables of interest, and mainly inquiring about their experiences while minimizing their personal assessments. We also contrast their responses to available public sources of data when available.

Dependent Variables

To examine the adoption of operating budgets, we measure time-to-adoption. This is the time from the founding of the company (time zero) to the date of adoption of this system. The company founding date was obtained from the CFO questionnaire and compared to the date reported in Venture One.[10] The kappa statistic of inter-rater agreement was 0.77 ($p < 0.001$).[11] We focus on the adoption of the operating budget as one of the main management accounting systems in a company. As such, it continues to receive significant attention in the research literature (Covaleski et al. 2003) and in teaching material. Budgets are forward-looking systems wherein the company projects its future financial performance to evaluate the financial viability of its strategy or to have a reference point to decide whether changes to the overall plan are granted. The date of adoption of the operating budget was collected from the CFO survey and triangulated with the CEO survey. The inter-rater measure of reliability was 0.62 ($p < 0.001$). In addition, the adoption of operating budgets event was reviewed during the CFO and CEO interviews.

We complement the adoption of budgets with the study of the adoption of other management accounting systems. In particular, we include: (1) cash budgets, (2) comparison of actual performance to budget (variance analysis), (3) operating expense approval, (4) capital expenditure approval, (5) product profitability, (6) customer profitability, and (7) customer acquisition costs. The date of adoption was calculated as described for the operating budget. The date of adoption of variance analysis, operating expense approval, capital expenditure approval, product profitability, and customer profitability were triangulated with the CEO questionnaire with the inter-rater agreement significant above 1 percent for all systems.

---

[10] Venture One is a public data source that collects funding information for startup companies.

[11] For those observations where the two sources of information disagreed (for all the variables where we triangulated the data), we double-checked the information with the CFO to solve the disagreement.

To examine the potential effect of management accounting system adoption on the performance of the company we collected information on number of employees, sales, operating income, and valuation. Where available, the information was triangulated against Venture One information; the statistic of inter-rater reliability was significant at 1 percent.[12] Table 2 presents the correlation between the various measures of annual performance: change in valuation, change in employees, change in revenue, and change in income.[13] Change in valuation over subsequent rounds is normalized by the NASDAQ index to control for the valuation environment. We estimate separate correlations for biotechnology companies because their business model is distinct enough—with longer time-to-revenue and to-breakeven and rapid headcount growth—to suggest potentially different correlation pattern. For the nonbiotechnology sample, change in valuation is highly correlated with change in employees and change in revenue, but not with change in income, suggesting that valuation during the start-up phase is linked to growth rather than income and consistent with previous evidence (Davila et al. 2003; Brush 1992). Moreover, growth in employees is negatively correlated with income, reflecting the first stages of companies' lifecycle before they break even. For biotechnology firms, change in valuation is correlated with changes in employees and negatively correlated with change in income, but not significantly correlated with change in revenues.

TABLE 2
Correlation Matrix for Company Performance Variables

	Change in Valuation	Change in Employees	Change in Revenue	Change in Income
Change in valuation		0.56*** 0.50**	0.38** −0.01	−0.19 −0.54***
Change in employees	0.68*** 0.58***		0.55*** 0.50***	−0.26*** −0.52***
Change in revenue	0.43*** 0.14	0.55*** 0.58***		0.01 −0.15
Change in income	−0.35** −0.53***	−0.19** −0.58***	0.01 −0.29**	

*, **, *** Significant at 10 percent, 5 percent, and 1 percent, respectively.

The Table presents Pearson correlations in the upper triangle and Spearman correlations in the lower one. The first correlation in each cell is for non-biotechnology companies and the second correlation is for the biotechnology sample. Change is estimated as relative change over the previous year; income is normalized by the previous year's absolute value. To reduce the influence of outliers in the Pearson correlation, variables are winsorized at the 5 percent level.

---

[12] While most companies in the sample are not publicly traded, information on valuations in successive private financing rounds is available for many of those with venture-backed financing from the Venture One database.

[13] Both Spearman and Pearson correlation are reported. Research by Hand (2003, 2005) on valuation of private companies supports the use of a Spearman correlation measure that does not assume a linear relationship. See also Armstrong et al. (2005).

Independent Variables

The presence of venture capital is also a time-varying variable that takes value of 1 those years in which the company has venture capital financing, and 0 otherwise. We collect this data from the CFO questionnaire, where we asked the person to detail the major financing events in the life of the company including type of financing, date, amount of funding received, and pre-money valuation if applicable. This funding information was triangulated with Venture One information when available. We measure size as the number of employees at the end of each year as reported by the CFO. We use a dummy variable that takes a value of 1 for the years in which the company had international operations. We gathered this variable from the business development managers' questionnaire, and in which was reported the year the company opened its first international operation.

CEO experience—defined as the number of years of work experience of the CEO—is a time-varying variable that changes each time that the CEO is replaced and as time progresses. This variable was reported in the CEO questionnaire and triangulated during the interview. Hiring a full-time financial manager is a time-varying variable that takes a value of 1 for those years in which the company had a full-time financial manager, and 0 otherwise. The information was gathered from the CFO questionnaire that asked the date in which this person was hired. The information was triangulated during the interview when the CFO was asked to describe the history of the finance function.

We measure CEO beliefs about planning through the analysis of interview data. In particular, we coded CEOs who described their management style as relying to a large extent on planning mechanisms—business plans, functional plans, and financial plans—as beliefs supportive of MAS. Three different researchers coded each interview and classified the companies into two groups. For those companies for which there was disagreement, the research team discussed the evidence before deciding how to code the company.

The replacement of the founder is also a time-varying variable that takes the value of 1 those years in which the CEO is not the founder, and 0 when the CEO is the founder. The information was gathered from the CEO questionnaire, which asked for the history of the CEO position during the life of the company and contrasted during the interview.

In addition to the prior variables that are predicted to affect MAS adoption, we model the hiring of a financial manager as an endogenous decision. To have a specified model, we need a variable that affects this endogenous variable but not MAS adoption. Systems infrastructure reflects the existence of a management systems' infrastructure in functions other than the accounting and finance function. Two forces influence how this variable affects the timing of a financial manager. Companies with more systems' infrastructure in other functions may also require better infrastructure in the finance function and thus leading to shorter time-to-hire. Conversely, less systems infrastructure may indicate a higher need for a person who brings discipline to the processes of the company. Because number of employees already proxies for scale while CEO experience proxies for the benefits of MAS, it is unclear which of these two arguments will dominate the sign of this variable's coefficient. Systems infrastructure is constructed as follows. For each of the following functions: human resources, sales, product development, partnership management, and strategic management, we asked the CEO and business development manager about the adoption of systems particular to these functions. Each system is coded as 1 if the system has been adopted for each year. For each function,[14] we estimate the percentage of systems adopted, normalize the measure for each function to weight each function equally, and then add across functions to come up with our measure of systems' infrastructure.

---

[14] Human resources, sales, and strategic management functions were included for all firms. Product development was only included for firms that develop products and partnership systems only for firms with partners.

V. EMPIRICAL RESULTS

Descriptive Statistics

Table 3, Panel A provides the industry composition of the sample—information technology companies comprise the largest industry in our sample (48/78 = 62%). More than 75 percent of the 78 companies had received venture funding when the research was conducted (Panel B). This high percentage reflects, in part, the sample selection criteria that resulted in a focus on companies that have grown to a significant size in a short time span.

Table 3, Panel C gives the summary statistics for the variables in the research. CEO's have mean work experience of 18 years with the 25th percentile at 12 years. The mean R&D intensity (R&D employees over total employees) is 40 percent, consistent with a technology-dominated sample. Income by the last year with available data is still negative

TABLE 3
Descriptive Statistics on Sample of Companies

Panel A: Industry Statistics

Industry	Number of Companies
Biotechnology	12
Information technology	48
Other industries[a]	18
Total	78

Panel B: Financing Statistics

Financing Type	Number of Companies
Venture capital financed	60
Other forms of financing	18
Total	78

Panel C: Descriptive Statistics on Research Variables

	Mean	Std. Dev.	Q1	Median	Q3
Number of CEOs	1.65	0.78	1	1	2
Years of total experience of CEO[b]	18.42	8.48	12	20	25
Age of the company	5.47	2.44	3	5	7
Number of employees[c]	118	62	71	113	155
R&D intensity[d] (%)	39.57	26.08	19.66	37.78	60.56
Revenues ('000)[e]	10,923	11,853	2,437	7,300	15,000
Income ('000)[e]	−9,455	15,668	−12,469	−4,700	29
Number of rounds of VC funding	3.43	1.78	2	3	5
Systems' infrastructure	−0.05	0.88	−0.78	−0.26	0.68
International firms	0.60	0.49	0	1	1
CEO planning beliefs (%)	17				

(*continued on next page*)

TABLE 3 (Continued)

Panel D: Descriptive Statistics on Management Accounting Systems[f]

	Time-to-adoption				Percentage of Companies
	Mean	**Q1**	**Median**	**Q3**	
Time-to-venture capital	1.08	0	1	1	77
Time-to-financial manager	2.33	1	2	3	93
Time-to-CFO	3.11	1.5	3	4	66
Operating budgets	2.25	1	2	3	94
Cash budgets	2.51	1	2	3.75	99
Variance analysis	2.90	1	3	4	89
Operating expenses approval	2.59	1	2	4	76
Capital expenditures approval	2.58	1	3	4	87
Product profitability	3.95	1.5	4	5.5	55
Customer profitability	3.92	1.25	4.35	5	54
Customer acquisition costs	3.74	1.5	4	5.5	32

Panel E: Ranking of Adoption of Management Accounting Systems[g]

	Ranking of Adoption			
	Mean	**Q1**	**Median**	**Q3**
Operating budgets	1.43	1	1	1.5
Cash budgets	1.54	1	1	1
Variance analysis	3.09	1	2	5
Operating expenses approval	2.38	1	2	3
Capital expenditures approval	2.13	1	1	3
Product profitability	2.91	1	2	5
Customer profitability	3.19	1	3	5
Customer acquisition costs	3.16	1	3	5

---

[a] Other industries include business services and consumer products.

[b] Estimated for all CEOs in the sample.

[c] Employees is calculated at the peak of each company's size.

[d] R&D intensity are estimated as a percentage of total employees defined as the sum of R&D employees for each of the years reported divided by the sum of total employees for those same years. Only companies that reported R&D employees are included.

[e] Revenues and income are for the last year of data available.

[f] *Time-to-adoption* is the average time-to-adoption (in years) for companies that get venture funding, have a financial manger, have a CFO, or adopt the system. *Percentage of companies* is the percentage of companies that have adopted the system by the end of the observation period.

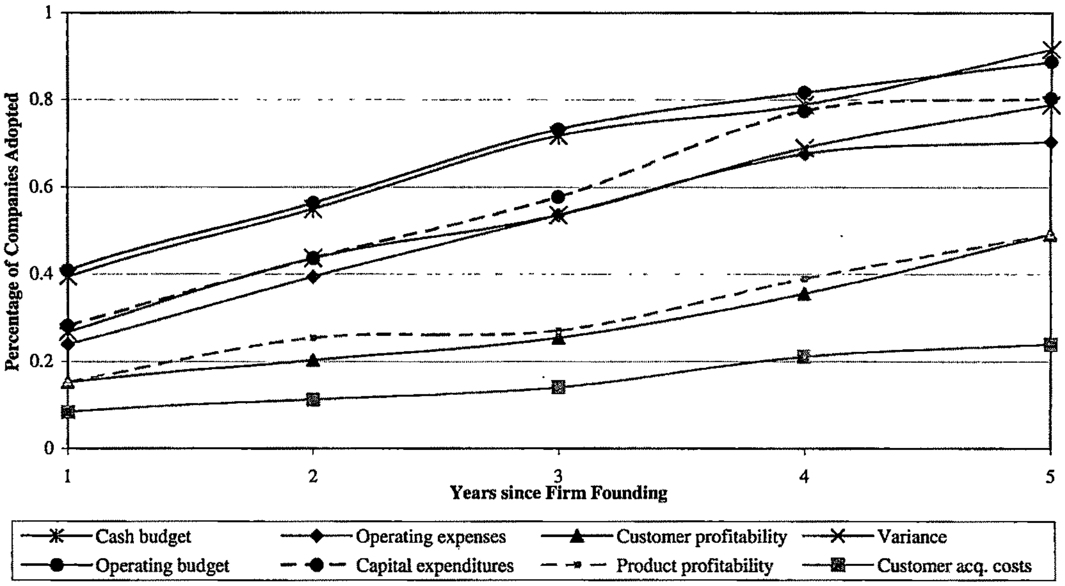
[g] The ranking is determined as follows: for each firm, we ranked the systems according to its sequence of adoption.

for more than 50 percent of the companies in the sample. The mean number of rounds of financing is 3.43.

Figure 1, Panel A plots the adoption of the eight management accounting systems over time. It plots the percentage of companies in the sample that report having adopted a system at the end of each year since founding. Forward-looking systems (operating and cash budgets) follow a similar pattern to each other and are adopted sooner than financial monitoring systems (variance analysis, operating expenses approval, capital expenditure approval, product profitability, customer profitability, and customer acquisition costs). Product profitability,

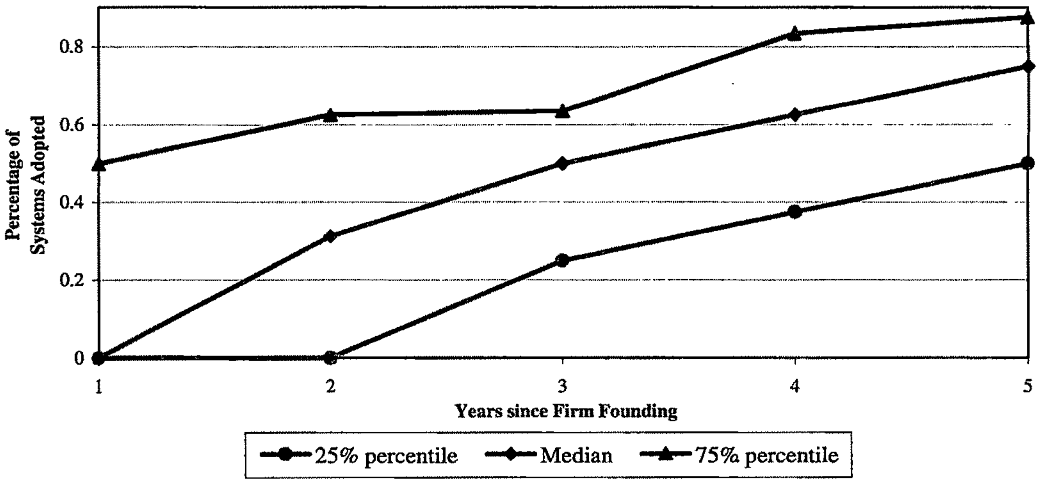
FIGURE 1
Time-Series Adoption of Management Accounting Systems

Panel A: Percentage of Companies Adopting Each System over Time



Each of the eight systems (operating budget, cash budget, variance analysis, operating expenditure policies, capital expenditure policies, product profitability, and customer profitability) is coded yearly as 1 (if the company reports having adopted the system), and 0 otherwise. For each year since funding (x-axis) we add the number of companies that have adopted the system over the total population to obtain the percentage in the y-axis.

Panel B: Percentage of Systems Adopted across the Sample



For each year and company we add the number of systems (including operating budget, cash budget, variance analysis, operating expenditure policies, capital expenditure policies, product profitability, and customer profitability) adopted. The graph reports the 25 percent quartile, median, and 75 percent quartile of number of systems adopted each year.

customer profitability, and customer acquisition costs are adopted across the sample of firms much slower that the other five systems. Figure 1, Panel B presents the distribution of the number of systems adopted per year across the sample of companies. The rate of adoption varies sizably across the sample.

Panel D of Table 3 details the average time-to-venture-capital, hiring of a financial manager, hiring of a CFO, and time-to-adoption of each system for those companies that experience each of these events. Operating budgets have the shortest time-to-adoption (2.25) of all systems. Panel D also gives the comparable statistics for product profitability, customer profitability, and customer acquisition costs, all of which take longer to adopt and fewer companies have adopted them—consistent with the need to have a significant revenue stream for those systems to be relevant. Panel E provides the descriptive statistics for the sequence in which the various management systems are adopted.

The Adoption of Operating Budgets

To use the information embedded in the time-to-adoption of operating budgets variable, we use a hazard model specification that allows modeling this duration data (Allison 1995). The observation period for each company starts with its founding and ends when the company adopts an operating budget. The hazard function is modeled as:

$$h(t, X(t)) = h(t, 0) \exp[(\beta' X(t)]$$

where $h(t, X(t))$ is the hazard rate at time t and $X(t)$ are the explanatory variables that are potentially time varying. To impose the least structure in our statistical specifications, we use a semi-parametric model. In particular, we use a Cox proportional hazard model with right-censoring and time-varying covariates. In contrast to parametric models, the Cox partial likelihood estimator does not require estimates of the baseline hazard function ($h(t, 0)$), which is assumed to be common across companies. Covariates affect the proportion of a company's hazard function relative to any other company's hazard.

Panel A, Table 4 reports three different models. Model #1 includes industry, number of employees, venture funding, and founder replacement—variables that have been examined in prior research (Davila 2005). The coefficients reported are hazard ratios. A coefficient on an independent variable greater (less) than 1 means the higher the independent variable value the shorter (longer) the time-to-adoption.[15] The evidence in Model #1 is consistent with the presence of venture capital and number of employees being associated with faster adoption of operating budgets.

Model #2 adds variables not examined in previous research: CEO experience, CEO beliefs about planning, and international presence. When adding these variables, number of employees and venture funding remain significant and CEO experience and CEO style that values planning are also associated with faster adoption of budgets. Figure 2 presents plots that highlight the two significant independent variables in both Models #1 and #2. Panel A of Figure 2 shows management accounting systems' adoption as a function of number of employees. There is a significant association between number of employees and faster adoption of operating budgets. Panel B of Figure 2 shows years since venture capital funding (as opposed to years since founding in Panel A, Figure 1). The advent of venture funding is associated with an increase in systems adoption. Interestingly, there is a higher

---

[15] The hazard ratio is e^{β}. The reported standard error is the one associated with the hazard ratio.

TABLE 4
Time-to-Adoption of Operating Budget

Panel A: Cox Regression[a]

	Model #1		Model #2		Model #3	
	Hazard Ratio	Robust Std. Error	Hazard Ratio	Robust Std. Error	Hazard Ratio	Robust Std. Error
Biotechnology	1.218	(0.578)	1.986	(1.276)	2.062	(1.269)
Information tech.	1.284	(0.567)	1.582	(0.964)	1.959	(1.092)
Employees	1.010***	(0.003)	1.010***	(0.003)	1.006**	(0.003)
Venture funding	2.836***	(0.888)	2.178**	(0.795)	1.365	(0.553)
Founder replaced	1.211	(0.397)	0.773	(0.266)	0.710	(0.242)
CEO experience			1.038**	(0.016)	1.012	(0.020)
CEO planning beliefs			2.085*	(0.851)	1.416	(0.628)
International presence			1.449	(0.385)	1.621*	(0.447)
Hire financial mgr.					3.774***	(1.691)
Number of obs.	245		201		201	
Number of companies	71		71		71	
Chi-square	56.41***		42.52***		52.73***	

Panel B: Cox Regression with Instrumental Variables[b]

	First Stage Time-to-Hiring a Financial Manager		Second Stage Time-to-Adoption of Operating Budgets	
Dependent Variable	Hazard Ratio	Robust Std. Error	Hazard Ratio	Robust Std. Error
Biotechnology			2.307	(1.933)
Information tech.			1.438	(1.045)
Employees	1.015***	(0.002)	1.021**	(0.008)
Venture funding	3.635***	(1.086)	5.415*	(4.866)
Founder replaced	0.770	(0.241)	1.156	(0.409)
CEO experience	1.028*	(0.017)	1.061**	(0.032)
CEO planning beliefs	2.336**	(0.871)	6.020**	(4.558)
International presence	1.100	(0.348)	1.311	(0.392)
Systems infrastructure	0.599**	(0.122)		
Predicted hazard rate to hire a financial manager			0.430	(0.256)
Number of obs.	202		177	
Number of companies	68		68	
Chi-square	99.27***		29.31***	

---

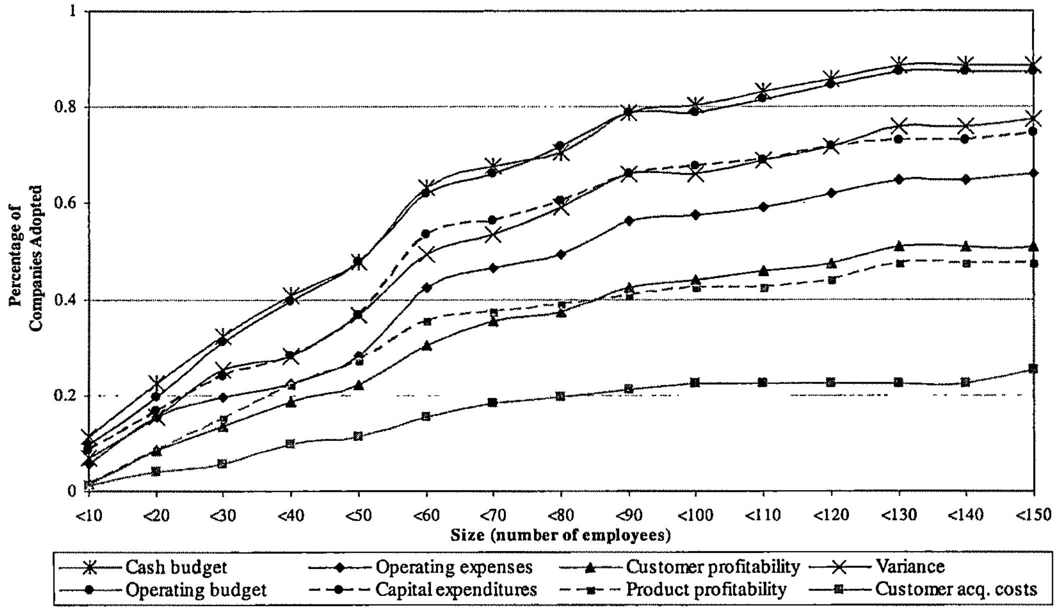
*, **, *** Significant at 10 percent, 5 percent, and 1 percent, respectively.

[a] Panel A reports Cox proportional hazard model of the time-to-adoption of operating budgets. *Biotechnology* and *Information technology* are time-invariant variables that take value of 1 for companies in these industries. *Employees* is the number of employees per year. *Venture funding* takes value of 1 for those company-years with venture capital funding. *Founder replaced* takes value of 1 for those company-years with a CEO that is not the founder of the company. *CEO experience* is the number of years of total work experience of the CEO as at that year. *CEO planning beliefs* takes value of 1 for companies classified as valuing planning. *International presence* takes value of 1 for those years in which the company had an international operation. *Hire financial mgr.* takes value of 1 for those years in which the company had a financial manager.

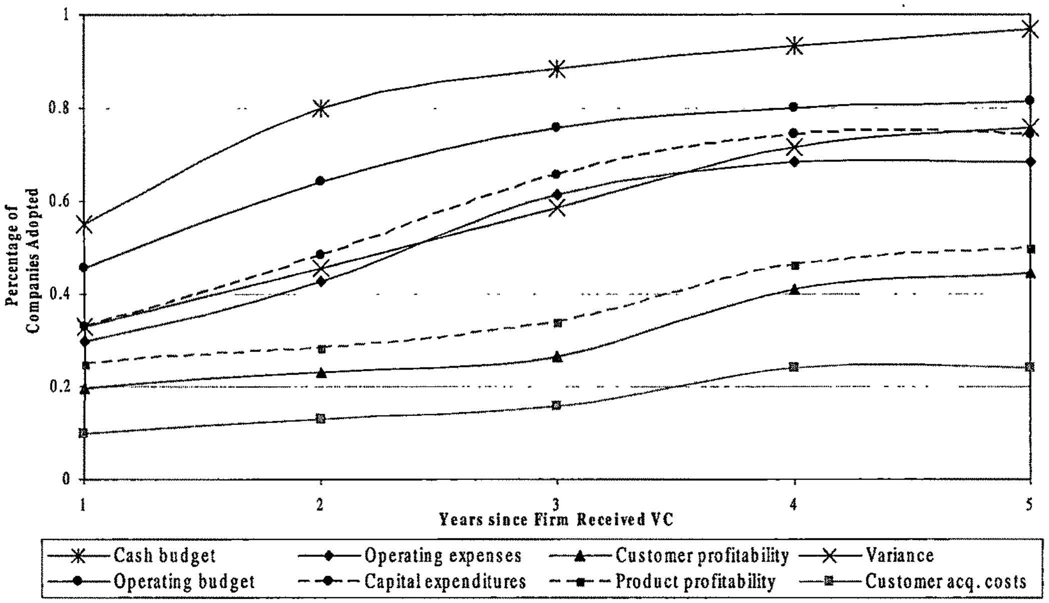
[b] Panel B reports a two-stage model. The first stage estimates the Cox proportional hazard model of the time-to-hire a financial manager. The second stage estimates the Cox proportional hazard model of the time-to-adoption of operating budgets, where the predicted hazard rate for the hiring of a financial manager from the first stage is used. Variables are as in Panel A. *Systems infrastructure* is the proportion of management control systems used in each company in functions other than the accounting and finance function.

FIGURE 2
Adoption of Budgets, Size, and Venture Capital Funding

Panel A: Percentage of Companies Adopting Each System by Size (Number of Employees)



Panel B: Percentage of Companies Adopting Each System Since Venture Capital Funding



adoption of cash budget than operating budgets in venture-backed firms. Cash flow burn is pivotal to planning when the next round of venture financing is required.[16]

Model #3 includes the hiring of a financial manager as an additional proxy for perceived benefits and costs of adopting budgets. This new variable is highly significant. Number of employees and international presence are also significantly associated with adoption. The significance of hiring a financial manager is consistent with operating budgets being part of the professional knowledge of a financial person; thus, in hiring this person, companies are hiring the expertise and, in particular, the knowledge about budgeting.

Panel A of Table 4 treats the hiring of a financial manager as an exogenous variable. However, this decision may be endogenous to the particular stage of each company. Panel B models the endogeneity of this decision using a two-stage procedure. The first stage estimates the hazard rate to hiring a financial manager. The model for this first stage uses the exogenous variables in Panel A except for industry dummies that are not expected to influence this decision. We also include an additional variable, systems infrastructure, that is expected to influence the hiring of a financial manager but not the time-to-operating-budgets. The results in the first stage indicate that number of employees, the presence of venture capital, CEO experience, CEO beliefs about planning, and low systems infrastructure are associated with faster time-to-hiring a financial manager. Companies that have more management systems in other functions are slower in time-to-hiring. The results in the second stage mimic those of Model #2 in Panel A of Table 4. Number of employees, the presence of venture capital, CEO experience, and CEO beliefs about planning are positively associated with time-to-adoption of operating budgets.

Table 5 complements the previous analysis with quotes from the interviews that illustrate the results in Table 4. The quotes illustrate how the empirical variables act in our sample of firms. For instance, the effect of number of employees was frequently mentioned; the quotes illustrate the breakdown of informal interactions, the need to decentralize, and the need to specify decision rights as the number of interactions increases exponentially. Similarly the quotes illustrate how the hiring of a financial manager and the effect of venture capital acted upon the time-to-adoption of MAS in different ways. These quotes reflect the thrust of most interviews (and the empirical results confirm these regularities).[17]

Operating Budgets and Company Performance

The last research question aims at examining the effect, if any, of the adoption of operating budgets in the evolution of the company. The previous results provide evidence on the adoption of operating budgets; in this subsection, we address the issue of whether having operating budgets matters to firm growth. To model company evolution, we use growth in employees and growth in revenues. We limit our use of valuation to univariate analysis because of the limited number of observations. To assess the effect of adopting operating budgets, we use an event study design where the year of adoption of the budget, the prior year, and the subsequent year are identified using three different dummy variables. In addition, we control for variables that may affect the evolution of the company. In

---

[16] The percentage of venture-backed companies which have either a cash budget or an operating budget is 58 percent (year 1), 80 percent (year 2), 92 percent (year 3), 95 percent (year 4), and 97 percent (year 5).

[17] The quotes in Table 5 are intended to illustrate the variables and not to provide statistical evidence on the research question. The quotes presented were those that best reflect the variables. While they are a small percentage of all the quotes relevant to these variables, they capture the thrust of most interviews. The very few comments against MAS were companies that adopted enterprise resource management systems ahead of their needs.

TABLE 5
Examples of Why Management Accounting Systems are Adopted

Reasons for Adoption	Illustrative Quotes
Size of the Organization	• "We had management by personality and it became evident that that wouldn't scale. We figured our personalities can go through one floor and two walls. After that management by personality doesn't work anymore."
	• "We used to be extremely tight when basically every expense went through me. When the organization got too big to do that, then we pushed responsibility down. You know, it happened when we went from 10 people to 20 people."
	• "What works for 20 people won't work for 50 or 200 people, in terms of communication, decision making, etc. So you need the systems to formalize and structure it more."
	• "I think that operating without a budget and without a cash flow analysis is like trying to walk with no eyes, it's a challenge."
	• "What started to happen is people would think that they had authority over a certain area. That was creating conflict. It became really important, particularly as we grew and we started to have branching trees of employees under managers, to define the areas that were under different parties' controls."
	• "It was the need to communicate to the department managers why they couldn't have everything and everybody they want. There are some limits. Here's a budget, we have to manage to this budget."
Hiring of Person with Expertise	• "In the first few years, it was all me doing it in my head to scale the business. The CFO now has put systems in place that everyone can use. The business is not dependent upon one person."
	• "Some systems expertise you import when you import the right people."
	• "I have so much experience of putting these things together that I pretty much knew what had to be done."
	• "I brought a lot of things from a financial control, financial reporting and financial planning perspective. For example, there was no three-month rolling cash forecast until I arrived. Now, every week, we produce a rolling three-month cash forecast. There wasn't any multiple-year forecast until I got there. There wasn't any acknowledgement that we had large loss carry forwards that might be a benefit at some point in the future."
	• "It was about 1998 when he joined. He was really financially strong. He put a lot of things in place ... on the financial planning side, the modeling, the business planning side ..."
Venture Capital	• "When we got our last round of funding in March 2000, we had $80 million and it went very very quickly. And there became a big concern that our burn rate was way too high and our cost of acquiring customers was way too high. At that point we took a very serious look at developing a more accurate budgeting process."
	• "We had a lot of venture money coming. I'm always concerned that when we get that kind of money, people will abuse it. We wanted to put a process in place to make sure that didn't happen."
	• "Along with the first fund-raising we did the first audit. We needed that as part of the fundraising."

particular, we control for venture capital funding, replacement of the CEO, and CEO beliefs about planning. The equation estimated is:

$$\begin{aligned} \textit{Company growth} &= \alpha + \beta_1 * \textit{prior year} + \beta_2 * \textit{adoption year} \\ &\quad + \beta_3 * \textit{subsequent year} + \Sigma\, \beta_i * \textit{control variables} + \varepsilon. \end{aligned}$$

Company growth is modeled in two different ways. In Panel A of Table 6, change in employees and change in revenues are the proxies for company growth. This model of company growth examines whether company growth is larger in those years around the adoption of operating budgets. For both employee and revenue growth, the coefficient for the adoption year is positive and significant indicating that the adoption of operating budgets is associated with periods of significant growth. For the revenue model, this growth extends to the year after the adoption of the budget. In Panel B of Table 6, company growth is modeled as the difference between growth the current year and growth the previous year,

TABLE 6
Operating Budgets and Company Performance

Panel A: Company Growth around Operating Budget Adoption

	Performance Measure	
Adoption of Budgets	**Δ Employees**	**Δ Ln(Revenues)**
Biotechnology	13.277* (7.891)	0.218 (0.188)
Information technology	1.696 (6.471)	0.279 (0.241)
Venture funding	−3.074 (5.527)	0.073 (0.170)
Founder replaced	−9.436** (4.531)	−0.209 (0.144)
CEO planning beliefs	−0.102 (6.495)	0.398* (0.234)
Prior year	10.975 (7.951)	−0.072+ (0.255)
Adoption year	19.177*** (5.872)	0.694*** (0.208)
Subsequent year	7.865 (5.434)	0.447** (0.177)
Number of obs.	302	236
Number of companies	63	53
Chi-square	19.83**	23.82***

---

*, **, *** Significant at 10 percent, 5 percent, and 1 percent, respectively.

+ Significantly different from adoption and subsequent years coefficients at 10 percent.

Constant term not reported and robust standard errors reported in parenthesis. Table reports the cross-sectional time series random-effect linear model estimation. *Biotechnology* and *Information technology* are time-invariant variables take value of 1 for companies in these industries. *Venture funding* takes value of 1 for those company-years with venture capital funding. *Founder replaced* takes value of 1 for those company-years with a CEO that is not the founder of the company. *CEO planning beliefs* takes value of 1 for companies classified as valuing planning. *Prior, adoption,* and *subsequent year* take value of 1 the year prior to, the year of adoption of, and the year after the adoption of budgets.

(*continued on next page*)

TABLE 6 (Continued)

Panel B: Change in Company Growth around Operating Budget Adoption

	Performance Measure	
Adoption of Budgets	**Δ Employees$_t$– Δ Employees$_{t-1}$**	**Δ Ln(Revenues)$_t$– Δ Ln(Revenues)$_{t-1}$**
Biotechnology	−0.668 (9.853)	−0.066 (0.220)
Information technology	−6.464 (8.227)	0.165 (0.277)
Venture funding	−3.720 (7.293)	−0.259 (0.199)
Founder replaced	1.979 (6.458)	0.260 (0.180)
CEO planning beliefs	10.133 (8.874)	−0.259 (0.300)
Prior year	10.742 (12.385)	−0.458+ (0.434)
Adoption year	13.120 (9.141)	0.659** (0.303)
Subsequent year	−2.257 (8.218)	0.094 (0.251)
Number of obs.	239	182
Number of companies	59	50
Chi-square	5.01	10.24

Variables as defined in Panel A, except for + which indicates significantly different from adoption year coefficient.

Panel C: Portfolio-Based Association between Operating Budget and Company Growth

Employees	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
Early adoption portfolio	20.52	58.55*, +	79.59***, +	91.57***	112.94***
Late adoption portfolio	7.56	26.50	53.06*	72.25**	80.62
Non-adoption portfolio	9.75	16.80	19.14	33.5	45.08

Revenues ('000)	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
Early adoption portfolio	414	4,840	8,586	9,369+	11,792**, ++
Late adoption portfolio	361	719	1,891	2,862	5,207
Non-adoption portfolio	484	1,620	2,478	3,272	4,446

Valuation (millions)	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
Early adoption portfolio	6.30	19.27+	81.62	52.23*	157.57**, +++
Late adoption portfolio	3.07	7.76	22.73	20.46	43.41
Non-adoption portfolio		1.72	4.85	5.16	13.64

(*continued on next page*)

TABLE 6 (Continued)

* (+), ** (++), ***(+++) Indicate difference significant at 10 percent, 5 percent, and 1 percent, respectively, from non-adoption portfolio, and from late adoption portfolio.

Companies are assigned to three portfolios based on whether they had adopted a budgeting system in their second year (*early adoption portfolio*) (40 percent of the companies), fourth year (*late adoption portfolio*) (40 percent of the companies), or not adopted by the fourth year (*non-adoption portfolio*). Sales includes non-biotechnology companies only. Table reports means and significance for regression coefficients of model *employees* (*sales*) = α_0 * *non-adoption portfolio* + α_1 * *late adoption portfolio* + α_2 * *early adoption portfolio.*

where growth the previous year is used as the expectation model for growth the current year. This alternative model investigates whether the year of adoption of the operating budget is associated with an "unexpected" growth in that year. The results are consistent with the year of adoption of the budget having significant "unexpected" sales growth; for employee growth, the signs are as expected but the coefficients not significant. In contrast to Panel A, the regression model as a whole is not significant, reflecting the difficulty in predicting company growth.

To further examine the association between budgets and company evolution, we study whether there is any relation between adoption of operating budgets and subsequent evolution. Specifically, we assign companies to three portfolios according to whether they have adopted operating budgets by the second year, fourth year, or not adopted by the fourth year. Next, we examine the evolution of these three portfolios over time.

Table 6, Panel C and Figure 3 reports the mean number of employees, revenues, and valuation for these three groups of companies. The early adoption portfolio size is significantly larger than the non-adoption portfolio except for year one. The difference in size between the late adoption and non-adoption portfolios is significant around year four, when the late adoption companies put operating budgets in place. Similar results are obtained when using a Kruskal-Wallis equality of populations rank test. Thus, companies that adopt operating budgets sooner grow faster. When looking at revenues the results are less significant with early adoption portfolio revenues significantly larger only for year five. Company valuation (relative to NASDAQ) for the early adoption portfolio is significantly larger than for the non-adoption portfolio in year four, and both portfolios in year five.

The analysis here is of an association kind and does not establish causality. One explanation is that early adoption of systems provides a platform that facilitates subsequent growth. An alternative explanation is that managers who expect future growth earlier are more likely to implement systems earlier than those not expecting such early growth. Note that this alternative explanation assumes managers have a reasonable ability to accurately forecast both the timing and magnitude of near- and medium-term growth.[18]

Other Management Accounting Systems Adoption

The prior analysis focused on the operating budget, which is typically the first management accounting system adopted. In this subsection, we extend the results to the seven other MAS systems in this research.

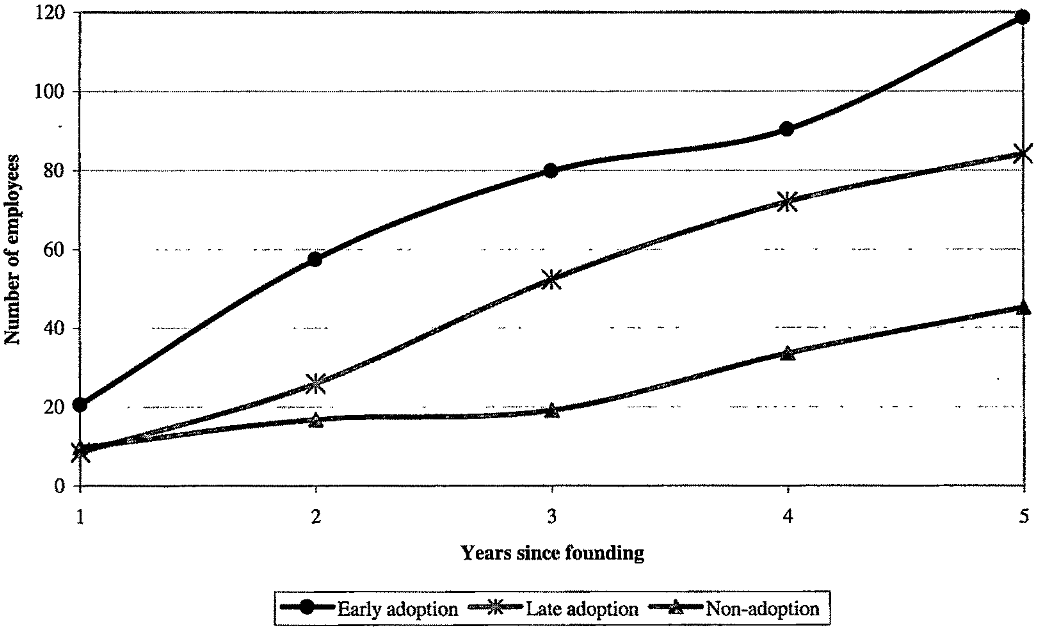
First, we examine the cross-sectional variation in the number of systems adopted (out of the eight management accounting systems) each year per company. We use a Poisson model where the dependent variable is the number of systems adopted each year and the

---

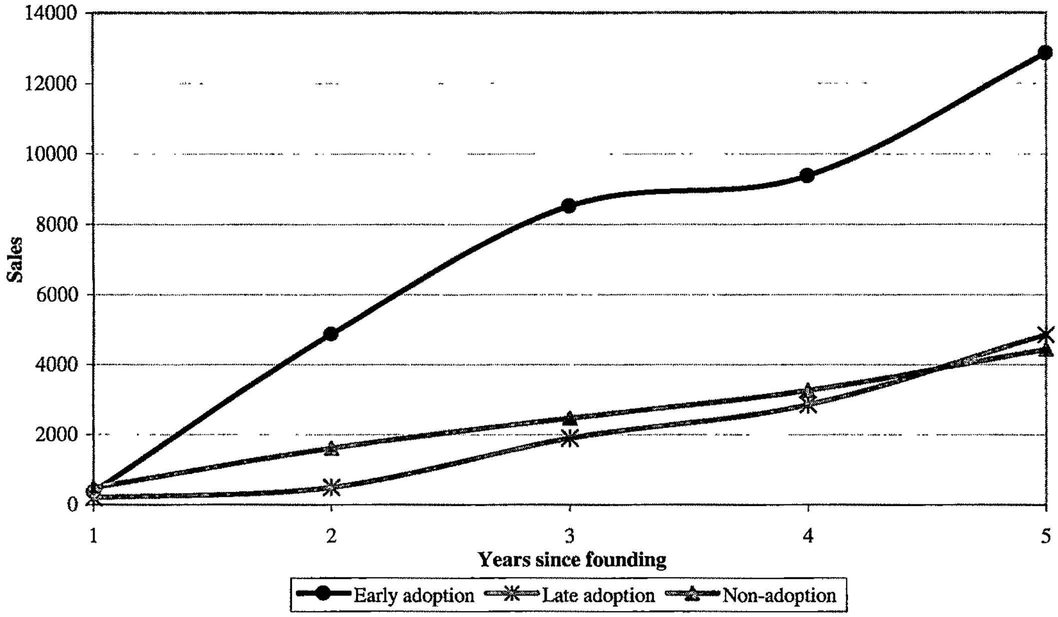
[18] The valuation evidence in Figure 3 will incorporate growth expectations into their measures due to their forward-looking basis. In contrast, headcount and revenue data relate to actual events and hence do not capture expectations as regards future growth of a company.

FIGURE 3
Adoption of Budgets and Company Evolution

Panel A: Operating Budgets and Number of Employees



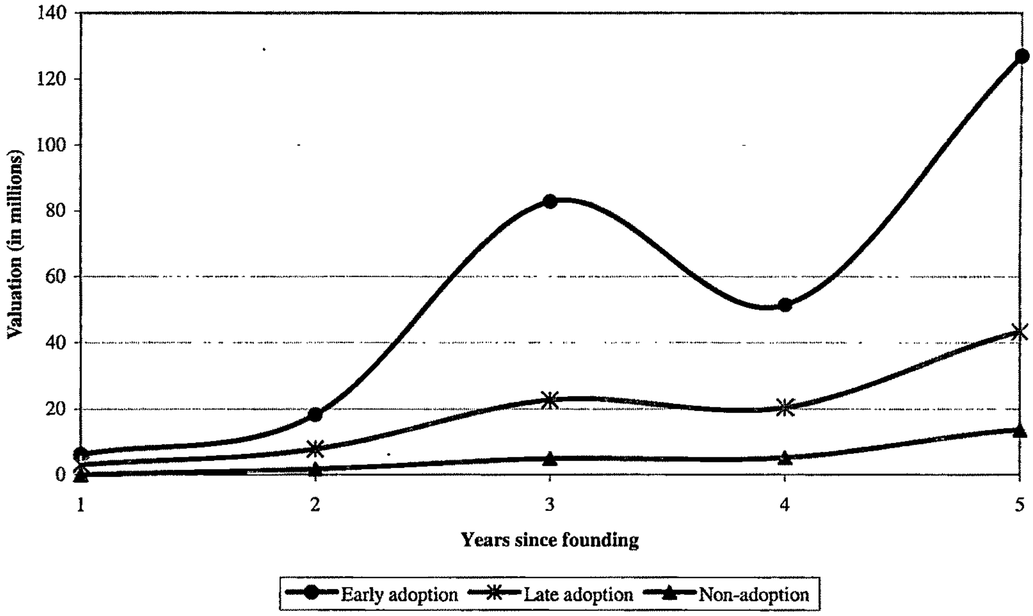
Panel B: Operating Budgets and Revenues



(continued on next page)

FIGURE 3 (continued)

Panel C: Operating Budgets and Valuation



The graphs report the mean number of employees (Panel A), sales (Panel B), and valuation (Panel C) for each of the three portfolios; the *early adoption portfolio* is formed with companies that have adopted an operating budget by year 2. The *late adoption portfolio* is companies that do not have an operating budget by year 2 but do so by year 4. The *non-adoption portfolio* is companies that have not adopted an operating budget by year 4.

independent variables are those that are included in Table 4 to predict the time-to-adoption of operating budgets. Predictions regarding independent variables are the same as for our main results (in Table 4). In particular, we expect agency costs (as proxied by the presence of venture capital funding), company scale (as proxied by employee headcount and international presence), perceived benefits and costs (as proxied by CEO experience), and top management style (as proxied by CEO beliefs about planning) to be associated with a higher number of systems adopted.

Table 7 reports the results organized as in Table 4. We report two models. Model #1 includes a restricted model with variables that have been used in prior research (Davila 2005). Model #2 includes the additional variables specific to our sample. Venture capital, numbers of employees, international presence, and CEO experience have a significant and positive association with the number of systems adopted. Comparing these results with Panel A, Table 4, international presence is significant in Table 7 and it is not in Table 4. The company scale factor associated with international operations appears to be associated with management accounting systems broadly defined rather than with the adoption of operating budgets. In contrast, CEO beliefs about planning is significant in Table 4 but not significant in Table 7. This result may be related to the control nature of the additional systems compared to the planning nature of operating budgets.

The second extension, presented in Table 8, replicates Model #2 (from Panel A, Table 4) for the seven other management accounting systems examined. The results are broadly

TABLE 7
Number of Systems Adopted

	Model #1		Model #2	
	Coefficient	**Robust Std. Error**	**Coefficient**	**Robust Std. Error**
Biotechnology	−0.248	(0.188)	0.020	(0.232)
Information tech.	−0.015	(0.158)	0.122	(0.192)
Employees	0.004***	(0.001)	0.003***	(0.001)
Venture funding	0.867***	(0.201)	0.670***	(0.188)
Founder replaced	0.278***	(0.100)	0.070	(0.117)
CEO experience			0.027***	(0.008)
CEO planning beliefs			0.105	(0.172)
International presence			0.201*	(0.109)
Number of obs.	472		390	
Chi-sq.	143.72***		161.85***	

*, **, *** Significant at 10 percent, 5 percent, and 1 percent, respectively.
Table reports Poisson model with number of systems—operating budget, cash budget, variance analysis, operating expenses approval, capital expenditures approval, and customer acquisition costs—adopted. Constant term included but not reported. *Biotechnology* and *Information technology* are time-invariant variables that take value of 1 for companies in these industries. *Employees* is the number of employees per year. *Venture funding* takes value of 1 for those company-years with venture capital funding. *Founder replaced* takes value of 1 for those company-years with a CEO that is not the founder of the company. *CEO experience* is the number of years of total work experience of the CEO as at that year. *CEO planning beliefs* takes value of 1 for companies classified as valuing planning. *International presence* takes value of 1 for those years in which the company had an international operation.

comparable to those in Table 4 for operating budgets. The presence of venture capital is associated with faster adoption of cash budgets, variance analysis, operating expenses approval, capital expenditures approval, and product profitability. However, it is insignificant in explaining the adoption of customer profitability and customer acquisition costs. Employee headcount, one of our proxies for company scale, is also significant in explaining cross-sectional variation in all systems except variance analysis and product profitability. International presence, the second scale proxy, is insignificant except for product profitability and customer acquisition costs where it is associated with longer time-to-adoption, contrary to expectations. CEO experience is significant and in the expected direction for all systems but product profitability and customer acquisition costs. CEO beliefs about planning is also significant and in the expected direction for cash budget, variance analysis, and operating expenses approval. Also consistent with Table 4, the replacement of the original CEO is insignificant except for product profitability where it is associated with faster adoption.

Limitations of the Research

Several caveats should be highlighted in interpreting the findings. First, our research does not address the causality issue of whether early system adoption provides a platform for future growth or whether managers who anticipate future growth choose to adopt MAS earlier. Second, our empirical variables capture particular realizations of the underlying theoretical constructs; thus, we only explain a piece of the phenomenon studied and we cannot rule out the influence of variables not included in the study. For instance, top management style is proxied by the CEO's beliefs on the value of planning mechanisms. Other

TABLE 8
Time-to-Adoption of Management Accounting Systems

	Cash Budget		Variance Analysis		Operating Expenses Approval		Capital Expenditures Approval	
	Hazard Ratio	Robust Std. Error	Hazard Ratio	Robust Std. Error	Hazard Ratio	Robust Std. Error	Hazard Ratio	Robust Std. Error
Biotechnology	1.739	(0.636)	1.090	(0.748)	1.405	(0.780)	0.991	(0.528)
Information tech.	0.784	(0.243)	2.287	(1.415)	2.137	(1.160)	1.405	(0.711)
Employees	1.007**	(0.003)	1.003	(0.003)	1.008**	(0.003)	1.008***	(0.003)
Venture funding	1.792**	(0.492)	1.811*	(0.576)	4.387***	(1.950)	1.765*	(0.564)
Founder replaced	0.642	(0.220)	0.594	(0.213)	0.753	(0.220)	0.975	(0.270)
CEO experience	1.035**	(0.016)	1.030*	(0.016)	1.069***	(0.020)	1.046***	(0.018)
CEO planning beliefs	2.250**	(0.821)	2.269**	(0.867)	2.220**	(0.888)	1.525	(0.611)
International presence	0.867	(0.315)	1.045	(0.338)	1.307	(0.358)	1.433	(0.473)
Number of obs.	205		241		253		235	
Number of companies	71		71		71		71	
Chi-sq.	29.68***		22.65**		40.54***		27.16***	

	Product Profitability		Customer Profitability		Customer Acquisition Costs	
	Hazard Ratio	Robust Std. Error	Hazard Ratio	Robust Std. Error	Hazard Ratio	Robust Std. Error
Biotechnology	0.045***	(0.047)	0.083**	(0.092)	1.041	(1.346)
Information tech.	0.276	(0.228)	0.500	(0.439)	2.481	(3.261)
Employees	1.004	(0.004)	1.007*	(0.004)	1.012***	(0.004)
Venture funding	3.212*	(2.108)	2.820	(1.849)	2.272	(1.334)
Founder replaced	2.221*	(1.006)	0.881	(0.427)	0.837	(0.457)
CEO experience	1.030	(0.034)	0.996*	(0.030)	1.056	(0.041)
CEO planning beliefs	0.773	(0.452)	1.339	(0.772)	0.963	(0.591)
International presence	0.466*	(0.211)	0.790	(0.387)	0.229***	(0.119)
Number of obs.	329		330		345	
Number of companies	71		71		71	
Chi-sq.	18.86**		14.65*		26.12***	

*, **, *** Significant at 10 percent, 5 percent, and 1 percent, respectively.

Table reports Cox proportional hazard model of the time-to-adoption of each particular financial system. *Biotechnology* and *Information technology* are time-invariant variables that take value of 1 for companies in these industries. *Employees* is the number of employees per year. *Venture funding* takes value of 1 for those company-years with venture capital funding. *Founder replaced* takes value of 1 for those company-years with a CEO that is not the founder of the company. *CEO experience* is the number of years of experience of the CEO for the year. *CEO planning beliefs* takes value of 1 for companies classified as valuing planning. *International presence* takes value of 1 for those years in which the company had an international operation.

aspects—such as the CEO's autocratic style versus broad-based executive team style—may also be relevant. Third, we model the hiring of a financial manager as an endogenous decision. However, endogeneity may also be present in other variables—for instance, the decision to adopt each MAS depends on the menu of MAS already adopted and planned to be adopted. Fourth, the study is subject to the normal limitations of field research and survey research (see Van der Stede et al. 2004). For example, we rely on information reported by managers. Whenever possible we triangulated the information with external sources and with other managers to decrease the threat to internal validity.

Several aspects of our sample selection limit the generalizability of our findings. We screened for companies as of 2002 that had a minimum 50 and a maximum of 150 employees and were less than ten years old. Companies smaller than 50 employees or those that had a relatively slow growth in headcount (such as taking over ten years to achieve 50 employees) are excluded from our screen. Companies that existed prior to 2002 but had gone out of business or been acquired likely would also not pass our screen. Our sample also has a bias toward venture-capital-backed companies. These companies are known, on average, to grow faster than non-venture-backed companies (see Davila et al. 2003). Each of these departures from a purely random sample comes with a lower ability to generalize from the results, but has important benefits to the research design. For example, the restriction to companies less than ten years old means we are more likely to interview managers who made the MAS adoption decision or who were there at the time the decision was made. Similarly, venture capitalists have prior experience with multiple startup companies when providing input to a new startup on the value of budgets and other MAS component systems. This prior experience is much broader than, say, a financial manager who has been with only one company prior to joining a startup.

The time period examined includes many companies that were started in the late 1990s. This was a period of high investment in the information technology and bio-technology sectors. Startup companies often were able to raise substantial amounts of investment money in their early financing rounds. This was an era of high-growth expectations for these startups. This limits the generalizability of the results to time periods with much lower growth expectations. However, the increased investment amounts at an early stage in this era likely heighten the focus investors would give to monitoring whether their financing is effectively and efficiently spent. MAS are one device that enables such monitoring on an ongoing basis.

Our restriction to only companies that achieved a certain size (50 employees within ten years) leaves "unresearched" the question of whether "too early" adoption of MAS may be a contributing factor for companies not achieving this size. A key factor here is the growth aspirations of the management and investors. The sample of interest would include growth-oriented startups (similar to many of our sample) that were early adopters of MAS, but did not achieve their high-growth expectations.

VI. CONCLUSION

This paper highlights when components of MAS are likely to be adopted by early-stage companies. The forward-looking financial planning components of MAS (operating budgets and cash budgets) are most likely to be adopted before the financial monitoring components (variance analysis, operating expense approval policies, capital expenditure approval policies, product profitability, customer profitability, and customer acquisition costs). We find a positive association between the adoption of operating budgets and company growth for early-stage companies. The accounting literature has long given budgets a central place in MAS evolution. With few exceptions, this literature has focused on established (frequently large) companies. We find strong evidence about the importance of budgets for early-stage, growth-oriented companies.

We probe hypotheses about the timing of adoption of individual MAS components. Our results reinforce constructs previously found to be significant—agency cost, perceived benefits and costs, company scale, and top management style. Moreover, the specific variables used as proxies for these constructs provide interesting insight into early-stage company MAS adoption. For example, hiring a financial manager is highly associated with MAS adoption. This variable has not been probed in research on established companies, as financial managers are already mostly "in place" in such companies. Another interesting result is the importance of venture capital. Companies that access venture capital speed up their adoption of budgeting and other MAS components such as variance analysis, operating expense approval, capital expense approval, and product profitability. This is an important indicator of the perceived value of such systems. Venture capitalists have rich experience with many startup companies, a subset of which has successful investment outcomes and a subset of which fail. Their belief in the importance of adopting MAS components at an early stage is based on a broad cross-section of prior company experience.

Management accounting systems are a subset of the total management systems adopted by the companies examined in this research. Other systems include those to facilitate the management of new product development, marketing and sales, human resources, and partnerships. An extension of this research would examine the timing of adoption of management accounting systems vis-à-vis other systems. A related extension would be to examine the association between total management systems adoption (timing and intensity) and company performance.

REFERENCES

Admati, A. R., and P. Pfleiderer. 1994. Robust financial contracting and the role of venture capitalists. *The Journal of Finance* 49: 371–402.

Ahrens, T., and C. Chapman. 2002. The structuration of legitimate performance measures and management: Day-to-day contests of accountability in a U.K. restaurant chain. *Management Accounting Research* 13: 151–171.

Allison, P. 1995. *Survival Analysis Using the SAS System: A Practical Guide*. Cary, NC: SAS Institute.

Anderson, S. W., and S. M. Young. 1999. The impact of contextual and process factors on the evaluation of activity-based costing systems. *Accounting, Organizations and Society* 24: 525–559.

———, J. W. Hesford, and S. M. Young. 2002. Factors influencing the performance of activity based costing teams: A field study of ABC model development time in the automobile industry. *Accounting, Organizations and Society* 27: 195–211.

Armstrong, C., A. Davila, and G. Foster. 2005. Venture-backed private equity valuation and financial statement information. *Review of Accounting Studies* (forthcoming).

Baiman, S. 1982. Agency research in management accounting: A survey. *Journal of Accounting Literature* (Spring): 154–213.

Ball, R., and G. Foster. 1982. Corporate financial reporting: A methodological review of empirical research. *Journal of Accounting Research* 20 (Supplement): 161–234.

Baron, J. N., M. D. Burton, and M. T. Hannan. 1999. Engineering bureaucracy: The genesis of formal policies, positions, and structures in high-technology firms. *The Journal of Law, Economics, and Organization* 15: 1–41.

Barron, J. M., and K. P. Gjerde. 1996. Who adopts total quality management (TQM): Theory and an empirical test. *Journal of Economics and Management Strategy* 5 (1): 69–106.

Baxter, J., and W. F. Chua. 2003. Alternative management accounting research—Whence and whither. *Accounting, Organizations and Society* 28: 97–126.

Bergemann, D., and U. Hege. 1998. Venture capital, moral hazard, and learning. *Journal of Banking and Finance* 22: 703–735.

Bonner, S., R. Hastie, G. Sprinkle, and S. M. Young. 2000. A review of the effects of financial incentives on performance in laboratory tasks: Implications for management accounting. *Journal of Management Accounting Research* 12: 19–64.

Brownell, P. 1995. *Research Methods in Management Accounting.* Melbourne, Australia: Coopers & Lybrand.

Brush, C. 1992. A comparison of methods and sources for obtaining estimates of new venture performance. *Journal of Business Venturing* 7: 157–171.

Cagwin, D., and M. Bouwman. 2002. The association between activity-based costing and improvement in financial performance. *Management Accounting Research* 13 (1): 1–39.

Chenhall, R. H. 2003. Management control systems design within its organizational context: Findings from contingency-based research and directions for the future. *Accounting, Organizations and Society* 28 (2–3): 127–168.

Covaleski, M. A., J. H. Evans, J. L. Luft, and M. D. Shields. 2003. Budgeting research: Three theoretical perspectives and criteria for selective integration. *Journal of Management Accounting Research* 15: 3–49.

Davila, A., G. Foster, and M. Gupta. 2003. Venture capital financing and the growth of startup firms. *Journal of Business Venturing* 18 (6): 689–708.

Davila, T. 2005. An exploratory study on the emergence of management control systems: Formalizing human resources in small growing firms. *Accounting, Organizations and Society* 30: 223–248.

Easton, G. S., and S. L. Jarrell. 1998. The effects of total quality management on corporate performance: An empirical investigation. *The Journal of Business* 71 (2): 253–307.

Fields, T. D., T. Z. Lys, and L. Vincent. 2001. Empirical research on accounting choice. *Journal of Accounting and Economics* 31 (1–3): 255–307.

Foster, G., and D. W. Swenson. 1997. Measuring the success of activity-based cost management and its determinants. *Journal of Management Accounting Research*: 109–141.

Granlund, M., and J. Taipaleenmaki. 2005. Management control and controllership in new economy firms—A life cycle perspective. *Management Accounting Research* 16: 21–57.

Greiner, L. E. 1998. Evolution and revolution as organizations grow. *Harvard Business Review* (May–June): 55–64.

Groot, T. L. C. M., and K. A. Merchant. 2000. Control of international joint ventures. *Accounting, Organizations and Society* 25 (6): 579–607.

Guilding, C., and L. McManus. 2002. The incidence, perceived merit and antecedents of customer accounting: An exploratory note. *Accounting, Organizations and Society* 27: 45–59.

Hand, J. R. M. 2003. Profits, losses, and the nonlinear pricing of Internet stocks. In *Intangible Assets: Values, Measures, and Risks*, edited by J. Hand and B. Lev, 248–268. New York, NY: Oxford University Press.

———. 2005. The value relevance of financial statements in venture capital markets. *The Accounting Review* 80 (2): 613–648.

Healy, P. M., and K. G. Palepu. 2001. Information asymmetry, corporate disclosure, and the capital markets: A review of the empirical disclosure literature. *Journal of Accounting and Economics* 31 (1–3): 405–440.

Hellman, T. F., and M. Puri. 2002. Venture capital and the professionalization of start-up firms: Empirical evidence. *Journal of Finance* 57: 169–198.

Holthausen, W. R., and R. L. Watts. 2001. The relevance of the value-relevance literature for financial accounting standard setting. *Journal of Accounting and Economics* 31 (1–3): 3–75.

Ittner, C. D., D. F. Larcker, and M. Rajan. 1997. The choice of performance measures in annual bonus contracts. *The Accounting Review* 72: 231–255.

———, and ———. 2001. Assessing empirical research in managerial accounting: A value-based management perspective. *Journal of Accounting and Economics* 32 (1): 349–410.

———, W. N. Lanen, and D. F. Larcker. 2002. The association between activity-based costing and manufacturing performance. *Journal of Accounting Research* 40 (3): 711–726.

———, D. F. Larcker, and T. Randall. 2003. Performance implications of strategic performance measurement in financial service firms. *Accounting, Organizations and Society* 28: 715–741.

Jick, T. D. 1979. Mixing qualitative and quantitative methods: Triangulation in action. *Administrative Science Quarterly* 24: 602–611.

Luft, J., and M. D. Shields. 2003. Mapping management accounting: Graphics and guidelines for theory-consistent empirical research. *Accounting, Organizations and Society* 28 (2–3): 169–249.

Marshall, C., and G. B. Rossman. 1995. *Designing Qualitative Research.* Thousand Oaks, CA: Sage Publications Inc.

Moores, K., and S. Yuen. 2001. Management accounting systems and organizational configuration: A life-cycle perspective. *Accounting, Organizations and Society* 26: 351–389.

Powell, W. W., and P. J. DiMaggio. 1991. *The New Institutionalism in Organizational Analysis.* Chicago, IL: University of Chicago Press.

Sandino, T. 2005. Introducing the first management control systems: Evidence from the retail sector. Working paper, University of Southern California.

Sapienza, H. J., and A. K. Gupta. 1994. Impact of agency risks and task uncertainty on venture capitalists-CEO interaction. *Academy of Management Journal* (37): 1618–1632.

Seidman, I. 1998. *Interviewing as Qualitative Research: A Guide for Researchers in Education and the Social Sciences.* New York, NY: Teachers College Press.

Shields, M. D. 1995. An empirical analysis of firm's implementation experiences with activity-based costing. *Journal of Management Accounting Research* (Fall): 148–166.

———. 2005. Operating budgets and budgeting-benefits and costs. In *Handbook of Cost Management*, 2nd edition, edited by M. W. Maher and R. L. Weil, 539–572. New York, NY: John Wiley & Sons.

Simons, R. 1995. *Levers of Control: How Managers Use Innovative Control Systems to Drive Strategic Renewal.* Boston, MA: Harvard Business School Press.

Sloan, R. 1993. Accounting earnings and top executive compensation. *Journal of Accounting and Economics* 16: 55–100.

Tushman, M., and D. Nadler. 1978. Information processing as an integrating concept in organizational design. *Academy of Management Review* 3: 613–624.

Van der Stede, W. A., S. M. Young, and C. X. Chen. 2004. Assessing the quality of evidence in empirical management accounting research: The case of survey studies. Working paper, University of Southern California.

Willard, G. E., D. A. Krueger, and H. R. Feeser. 1992. In order to grow, must the founder grow: A comparison of performance between founder and non-founder managed high-growth manufacturing firms. *Journal of Business Venturing* 7: 181–195.

THE ACCOUNTING REVEIW
Vol. 80, No. 4
2005
pp. 1069–1100

Stock Price, Earnings, and Book Value in Managerial Performance Measures

Sunil Dutta
University of California, Berkeley

Stefan Reichelstein
Stanford University

ABSTRACT: This paper develops a multiperiod principal-agent model in which a manager must be given incentives to undertake investments and to exert personally costly effort. Investments are "soft" (e.g., intangible assets) and therefore entail measurement errors for the accounting system as it seeks to separate investments from operating expenditures. This separation is of no concern to the stock market, which draws on its own information about future cash flows resulting from current investments. The firm's stock price, however, reflects all value-relevant information, parts of which are not incentive relevant. Optimal incentive provisions must combine "forward-looking" market information with "backward-looking" accounting information. Under certain conditions, optimal performance measures can be expressed as a weighted average of economic value added (residual income) and market value added.

I. INTRODUCTION

To provide incentives for senior managers, firms rely on a range of performance indicators based on accounting data and external market information. Managerial compensation packages frequently comprise multiple ingredients including stock grants, stock options, and cash bonuses based on earnings or return on assets.[1] Survey evidence indicates that there is considerable variation in the structure of managerial compensation schemes across different industries. For instance, an observation commonly made in connection with high-technology firms is that these firms tend to rely more heavily on stock-based compensation in comparison to firms in more traditional industries.[2]

We develop a multiperiod and multitask agency model in which a manager must be given incentives to undertake investments in addition to exerting personally costly effort. While investments do not impose a personal cost on the manager, the principal nonetheless

---

[1] See, for instance, Lambert and Larcker (1987), Jensen and Murphy (1990), Rappaport (1999), and Core et al. (2003).

[2] Ittner et al. (2003) provide a summary of the related empirical literature.

We thank the seminar participants at Columbia University, Yale University, Northwestern University, the University of Chicago (Chicago-Minnesota Theory Conference), The University of Iowa, and the University of Vienna for their comments. We are particularly grateful to Jerry Feltham, Dirk Hackbarth, Steve Huddart, Jim Ohlson, Bill Rogerson, and two anonymous reviewers for many helpful comments and suggestions.

Editor's note: This paper was accepted by Steve Huddart, special editor.

Submitted January 2004
Accepted March 2005

faces an induced incentive problem because the periodic cash flows reflect both investment and managerial effort. Though cash payoffs from current investments are not realized until later, the stock market reflects information about these payoffs in the firm's current stock price. In the basic version of our model, the market provides a perfect assessment of future investment returns at each point in time.[3] Thus, inclusion of the "forward-looking" stock price in the manager's performance measure is one way to generate investment incentives. However, market prices must include all value-relevant components of investment returns, even though some of these are random fluctuations beyond the manager's control.

An accrual accounting system, which shields the manager from current investment expenditures by capitalizing them, provides an alternative way to generate investment incentives. A drawback of accrual accounting in our model is that the measurement for investment expenditures is subject to errors. A third way of providing investment incentives is to ignore forward-looking market prices and historical, backward-looking accounting measures altogether, and rely exclusively on the stream of realized cash flows. The main questions then become (1) whether it is essential to rely on all three performance indicators, and (2) how the essential indicators should be aggregated in optimal performance measures.

Our analysis demonstrates that optimal performance measures must rely on all sources of information, i.e., cash flows, accruals, and stock prices, even under the most ideal contracting conditions: the parties are equally patient, they can make long-term commitments, and the underlying agency problem is stationary.[4] Under those ideal conditions, identical incentive contracts based on the actual periodic cash flows alone would cause the manager to internalize the principal's investment objectives. Nonetheless, such contracts would not be optimal because the manager would be exposed to the entire volatility associated with investment payoffs. For the purpose of performance measurement, stock price is not only essential in providing investment incentives, but also for "filtering out" some of the variability in investment returns. This latter contracting role of stock prices can be thought of as a form of intertemporal relative performance evaluation in which current price serves as a benchmark for evaluating the manager's future performance.

The main role of the accounting system in our model is to separate investment expenditures from current operating expenses, but this separation is assumed to involve measurement errors. For example, investment expenditures for product development, personnel training, or process improvement can frequently not be traced directly, but instead are measured according to internal allocation rules that rely on select allocation bases. By capitalizing the measured investment expenditures, accounting income shields managers, at least partially, from the negative cash flow effect of current investment expenditures, and thereby provides investment incentives. At the same time, however, the accounting measurement errors introduce risk factors of their own that entail a corresponding agency cost.

The weight on current market price relative to the weight on current income in an optimal performance measure reflects the need to balance two risk factors: measurement error in the identification of investment expenditures and variability of future cash flows reflected in the firm's current market price. To optimize this trade-off, the principal adopts a conservative asset valuation rule, i.e., a dollar of measured investment expenditures is capitalized at a rate of less than one, even though accounting measurements are unbiased on average. Furthermore, the optimal capitalization rate is decreasing in the amount of accounting measurement error. For potentially large errors, it becomes desirable to adopt a policy of full expensing.

---

[3] In contrast, in the one-period models of Paul (1992), Bushman and Indjejikian (1993), Kim and Suh (1993), and Feltham and Wu (2000), the market's valuation of the firm is afflicted by exogenous random disturbances.

[4] Our conclusion here stands in partial contrast to earlier work, e.g., Dutta and Reichelstein (1999, 2003), demonstrating that, under those ideal conditions, contracts based on actual cash flows only are optimal.

Our initial analysis considers a dividend policy under which the entire current cash flow (net of compensation) is fully paid out to the firm's owners. We then demonstrate that our findings on the relative use of accounting income and market price can be adapted to arbitrary dividend policies. To replace market price by a measure that is invariant to past dividend payments, the principal can resort to *market value added,* i.e., cum-dividend price less the compounded beginning-of-the-period price. Similarly, *residual income* (or economic value added) is invariant to current and past dividend payments, yet it preserves the information content of accounting income. We find that a weighted average of market value added and residual income is an optimal performance measure irrespective of the firm's dividend policy. In fact, a linear combination of these two value-added measures becomes essentially the unique optimal performance measure if the compensation schemes are memoryless, i.e., the compensation parameters are not conditioned on past information.

While the basic version of our model gives the market perfect ability to project the firm's future cash flows, we also consider a more realistic scenario in which the market receives imperfect information, i.e., its aggregate signal of future cash flows resulting from current investment is subject to an (unbiased) error term. One might expect that as market information becomes less precise, an optimal performance measure puts less weight on current stock price and instead relies more heavily on accounting measurements and future cash flows. We find, however, that this intuition is generally not correct due to a countervailing effect: with less precise information, the market's valuation of the firm relies less on its own noisy signal and more on the manager's equilibrium investment choice. As a consequence, the sensitivity of the signal provided by current stock price decreases, and this may make it desirable to put a nominally larger weight on stock price.

In the earlier one-period models of Paul (1992), Bushman and Indjejikian (1993), and Kim and Suh (1993) the firm's market price aggregates signals received by the market and the firm's accounting system. Each of these signals reflects the manager's unobservable effort plus some random noise.[5] Ideally, the manager's rewards would be based on the firm's terminal cash flow, yet because this cash flow is assumed to be unavailable for contracting purposes, it becomes essential to rely on both the accounting signal and the stock price. In contrast, our multiperiod model with investment choices allows for the possibility that managerial compensation is based exclusively on the stream of delivered cash flows. To do so, however, would unduly constrain the provision of incentives across time periods. Both the forward-looking stock price and the backward-looking accounting information are valuable performance indicators beyond the actual cash flows.

Aside from earlier studies on accounting data versus stock price in executive compensation schemes, our paper is also related to recent work examining the inclusion of nonfinancial variables in managerial performance measures.[6] The alleged informational role of these variables is that they are indicative of future cash flows resulting from current or past decisions. The firm's stock price serves a similar function in our model. The essential difference, however, is that stock price is not merely a mechanical indicator of future cash flows, but instead reflects the market's equilibrium assessment of future decisions and outcomes given the firm's long-term incentive plan.

---

[5] The second half of Bushman and Indjejikian's (1993) paper considers a setting in which the manager's actions are two-dimensional, yet income only reflects one of those actions.

[6] See, for example, Dikolli (2001), Sliwka (2002), and Dutta and Reichelstein (2003).

The remainder of the paper is organized as follows. Section II describes the model. In Section III, we first examine the need for stock price in addition to actual cash flows in a simplified setting in which accounting measurements are highly imprecise and therefore useless for contracting purposes. Our main results on the optimal aggregation of market- and accounting-based measures, in particular market value added versus economic value added, are derived in Section IV. Imperfect market information is introduced in Section V. We conclude in Section VI.

II. MODEL DESCRIPTION

We consider a principal-agent relationship that extends over T periods. In each period, the agent (manager) contributes to current operating cash flow through personally costly effort. In addition, the agent makes investment decisions. These investments require an initial cash outflow in a given period and result in uncertain cash inflows in the next period.[7] For any $1 < t \leq T$, the firm's total cash flow is:

$$\tilde{c}_t = a_t + \tilde{\varepsilon}_t + (m_{t-1}(b_{t-1}) + \tilde{\mu}_{t-1}) - b_t.$$

Here, a_t represents the agent's effort and $\tilde{\varepsilon}_t$ is a random variable that reflects *operating noise.* The cash investment in period t (which starts at date $t-1$ and ends at date t) is denoted by b_t, with $b_t \in [\underline{b}, \bar{b}]$. The function $m_{t-1}(b_{t-1})$ represents the expected gross return from investment undertaken in period $t-1$; this expected return function is assumed to be strictly concave such that $m'_{t-1}(b_{t-1}) \rightarrow \infty$ as $b_{t-1} \rightarrow \underline{b}$, and $m'_{t-1}(b_{t-1}) \rightarrow 1$ as $b_{t-1} \rightarrow \bar{b}$. The actual investment returns are uncertain, as reflected in the noise term $\tilde{\mu}_{t-1}$, and the amount of risk is assumed to be independent of the scale of investment over the range $[\underline{b},\bar{b}]$. The realization of $\tilde{\mu}_{t-1}$ occurs at the end of period $t-1$. As a benchmark, we denote the first-best level of investment by b_t^0, i.e., b_t^0 maximizes $\gamma \cdot m_t(b_t) - b_t$, where $\gamma \equiv (1 + r)^{-1}$ denotes the discount rate based on the interest rate r.

Initially, all parties are assumed to know at date t the investment return $f_t \equiv m_t(b_t) + \mu_t$ to be realized at date $t+1$. However, f_t is assumed to be noncontractible, and therefore compensation cannot be tied directly to this variable. Our interpretation here is that knowledge of f_t reflects the "collective wisdom" of the market and is based on a variety of information sources in the economy, e.g., analysts' reports. In accordance with this interpretation, f_t is reflected in the firm's market price at date P_t.

The firm's accounting system is assumed to generate a verifiable and contractible signal y_t of the current investment expenditure b_t. Our model captures the notion that for "softer" investments, like those in product development, process improvement, and personnel training, the accounting system is imperfect in its ability to separate investment expenditures from current operating expenditures. Such separation of expenditures is subject to measurement errors when different expenditures are not directly traceable but instead must be derived through some allocation procedure. To capture the notion of accounting measurement error, we assume that the signal y_t is equal to the true expenditures plus a random error term. Thus, the accounting system generates the following verifiable measure of investment:

$$\tilde{y}_t = b_t + \tilde{\eta}_t,$$

---

[7] It would be straightforward to extend our analysis so as to allow for the possibility that investment returns are received over several periods.

where $\tilde{\eta}_t$ is a zero-mean normally distributed random variable that reflects measurement errors. An arbitrarily large variance of the random variable $\tilde{\eta}_t$ effectively amounts to a setting in which operating expenditures cannot be separated from investment expenditures.[8] The signal y_t can be used to record an asset value: $A_t = k_t \cdot y_t$, where the "capitalization rate" k_t is a design variable for the purpose of performance measurement. Without loss of generality, we presume that investments are fully depreciated at the end of their useful lives, i.e., after one period.[9]

It should be noted that, in contrast to the earlier work of Bushman and Indjejikian (1993) and Kim and Suh (1993), we do not assume that the market is intrinsically noisy. In the basic version of our model the market delivers a noiseless and unbiased valuation of the firm. In doing so, the market price must include all value-relevant information including the realization of the noise term μ_t. We also note that, in contrast to the above-mentioned studies, there is no need for the market to rely on the available accounting information in our settings. Given knowledge of f_t, the market does not learn anything from A_t about the future benefits of current investments. Furthermore, the firm's market price is unaffected by current cash flow provided this amount is fully paid out in dividends to shareholders. This feature will obviously change for alternative dividend policies, as examined in Section IV.

To keep our multiperiod agency model analytically tractable, we adopt the so called LEN framework with linear contracts, exponential utility, and normally distributed noise terms. Specifically, the noise terms $\tilde{\mu}_t$, $\tilde{\varepsilon}_t$, and $\tilde{\eta}_t$ are assumed to be independent and normally distributed such that $\tilde{\varepsilon}_t \sim N(0,\sigma_\varepsilon^2)$, $\tilde{\mu}_t \sim N(0,\sigma_\mu^2)$ and $\tilde{\eta}_t \sim N(0,\sigma_\eta^2)$. The principal is risk-neutral and therefore seeks to maximize the present value of future expected cash flows net of compensation payments (which is equivalent to maximizing the cum-dividend price of the firm). The manager is assumed to be risk-averse and his preferences at date t can be described by an additively separable exponential utility function of the form:

$$\mathbf{U}_t = -\sum_{i=t+1}^{\infty} \gamma^{i-t} \cdot \exp\{-\hat{\rho} \cdot (\phi_i - e_i(a_i))\}.$$

In each period, the agent's current utility is given by consumption of money, ϕ_i, less the cost of effort $e_i(a_i)$. This function is assumed to be increasing and convex on $a_i \in [0,\bar{a}]$, such that $e_i'(0) = 0$ and $e_i'(a_t) \rightarrow \infty$ as $a_i \rightarrow \bar{a}$. The coefficient $\hat{\rho}$ represents the agent's degree of risk aversion.

Consistent with earlier literature on repeated agency models, the agent is assumed to have access to third-party banking. Specifically, the agent can borrow and lend in each period at the interest rate r. Access to third-party banking for the agent ensures that the choice of incentive scheme does not need to be concerned with smoothing the agent's consumption over time. Furthermore, third-party banking in combination with additively separable exponential utility implies that at any point in time the agent's preferences over alternative incentive schemes are independent of his current wealth. Without loss of generality, we set the agent's initial wealth to zero. Similarly, there is no restriction in assuming that upon leaving the firm, the agent can earn a net wage of zero, i.e., he can earn a fixed wage $\hat{s}_t$ by exerting effort $\hat{a}_t$, such that $\hat{s}_t - e_t(\hat{a}_t) = 0$.

---

[8] In the analysis of Kanodia et al. (2004), the accounting system also generates an imperfect measure of investment. In the absence of agency considerations, these authors examine the impact of measurement error on the investment decisions of an owner/manager who wishes to maximize the value of his firm. Along similar lines, Kanodia and Mukherji (1996) demonstrate the importance of separating investment expenditures from operating expenditures.

[9] If one were to extend our model so as to allow for investment returns to be delivered over multiple periods, the choice of depreciation method would be essentially indeterminate in the current framework. The reason is that in our setting the principal knows the profitability of investments, but she cannot verify the actual investment expenditure. In contrast, Rogerson (1997) and Reichelstein (1997, 2000) consider settings in which investments are verifiable and the role of the depreciation schedule is to motivate a better informed manager to accept all positive NPV projects, and only those.

The new information variables available for contracting in period t are c_t, A_t and P_t. The entire information available to both parties at the beginning of period $t+1$ can therefore be represented as:

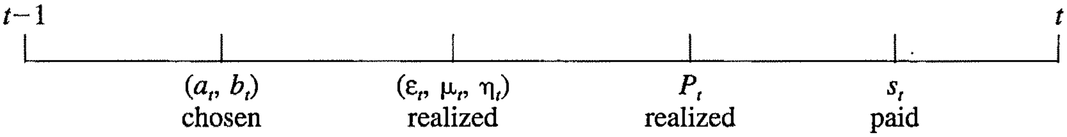
$$\mathbf{I}_t \equiv (\mathbf{I}_{t-1}, (c_t, A_t, P_t)). \tag{1}$$

In the LEN framework, compensation schemes are restricted to be linear:[10]

$$\{s_t = \alpha_t + \beta_t \cdot \pi_t\}_{t=1}^{T}, \tag{2}$$

where π_t is the manager's performance measure that can be based on any linear combination of the variables in $\mathbf{I}_t$. While the bonus coefficients, β_t, are constants, it will facilitate the economic interpretation of some of our results to allow the fixed payments, α_t, to depend (linearly) on the past information variables $\mathbf{I}_{t-1}$. A compensation scheme will be called *memoryless* if both α_t and β_t are constants and therefore all memory requirements are embodied in the performance measure π_t.[11] The sequence of events in any given period is depicted below.

Events in Period t



Given long-term contracts and the agent's access to credit, there is no need for the principal to condition current compensation on past information variables that have no bearing on current or future realizations. In particular, there is no loss of generality in restricting attention to performance measures of the form:

$$\pi_t = c_t + A_t + w_t \cdot A_{t-1} + u_t \cdot P_t + v_t \cdot P_{t-1}, \tag{3}$$

where w_t, u_t, and v_t are coefficients to be chosen by the principal in conjunction with the compensation parameters α_t and β_t. Without loss of generality, the coefficient on cash flow c_t has been normalized to 1. Similarly, the coefficient on the asset value A_t can be set equal to 1 because the asset valuation rule, i.e., the capitalization rate k_t, is chosen endogenously by the principal.

---

[10] The manager receives his last compensation at date T even though the cash payoffs of the last investment are not received until date $T+1$. This specification is again without loss of generality because at date T the stock market has perfect information about the investment payoff at date $T+1$.

[11] For compensation schemes that are not memoryless, i.e., α_t may depend on $\mathbf{I}_{t-1}$, any claim about optimal performance measures will obviously only pertain to the current period information variables (c_t, A_t, P_t).

In each period, the stock market values the firm at its expected value of future cash flows. Initially, we consider a full-payout dividend policy, i.e., dividends are equal to total cash flow less the managerial compensation payment in each period. The firm's ex-dividend fair market value then becomes:

$$P_t = \sum_{i=t+1}^{T} \gamma^{i-t} \cdot \mathrm{E}[\tilde{c}_i - \tilde{s}_i | \mathbf{I}_t^-, f_t], \tag{4}$$

where $\mathbf{I}_t^-$ denotes the informational variables in $\mathbf{I}_t$ except for P_t. We note from Expressions (1)–(3) that the manager's future compensation depends on current market price, which in turn depends on future compensation. In particular, the market anticipates that for every dollar of current market value, the manager will be paid v_{t+1} in the following period. Given linear contracts, however, it is readily verified that the equilibrium price is:

$$P_t = \lambda_t \cdot f_t + \omega_t \cdot A_t + K_t, \tag{5}$$

where the constant K_t depends on the compensation parameters of future periods and:

$$\lambda_t \equiv \frac{\gamma \cdot (1 - \beta_{t+1})}{1 + \gamma \cdot \beta_{t+1} \cdot v_{t+1}},$$

$$\omega_t \equiv -\frac{\gamma \cdot \beta_{t+1} \cdot w_{t+1}}{1 + \gamma \cdot \beta_{t+1} \cdot v_{t+1}},$$

with $\beta_{T+1} = 0$.[12]

With long-term contracts, the risk-neutral principal is concerned only with the present value of compensation payments over the contracting horizon, but is indifferent toward the actual timing of payments. The same is true for the agent since he has additively-separable CARA risk preferences and can borrow and lend at the principal's interest rate. To characterize the agent's preferences for alternative long-term contracts, we note from Equations (3)–(5) that for a dollar increase in f_t, managerial compensation increases by $\beta_t \cdot u_t \cdot \lambda_t$ in period t and by $\beta_{t+1}(1 + v_{t+1} \cdot \lambda_t)$ dollars in period $t+1$. Therefore the total discounted increase in compensation is given by $\beta_t \cdot \Gamma_t$ with:

$$\Gamma_t \equiv u_t \cdot \lambda_t + \frac{\gamma \cdot \beta_{t+1}}{\beta_t}(1 + v_{t+1} \cdot \lambda_t). \tag{6}$$

We shall refer to Γ_t as the *effective aggregate weight* on the information variable f_t. Similarly, the effective aggregate weight on the signal y_t is given by $\beta_t \cdot k_t \cdot \Lambda_t$, where:

$$\Lambda_t \equiv 1 + u_t \cdot \omega_t + \frac{\gamma \cdot \beta_{t+1}}{\beta_t}(w_{t+1} + v_{t+1} \cdot \omega_t). \tag{7}$$

Lemma 1: For any compensation scheme of the form in (2)–(3), the certainty equivalent of the agent's expected future utility at date t is given by:

---

[12] See the proof of Lemma 1 for details. All proofs and a table of all symbols are provided in the Appendix.

$$CE_t(\mathbf{I}_t) = \sum_{i=t+1}^{T} \gamma^{i-t} \cdot \{E[s_i(\tilde{\pi}_i)|\mathbf{I}_t] - e_i(a_i) \\ - \rho \cdot \beta_i^2 \cdot (\sigma_\varepsilon^2 + \Gamma_i^2 \cdot \sigma_\mu^2 + \Lambda_i^2 \cdot k_i^2 \cdot \sigma_\eta^2)\}$$

where $\rho \equiv \frac{1}{2} \cdot \hat{\rho} \cdot (1 - \gamma)$.

In the multiperiod LEN model, the agent's preferences reduce to a present value of future mean-variance payoffs. For any long-term contract, the risk premium required by the agent is determined by the aggregate weights Γ_t and Λ_t attached to the information variables f_t and A_t, while the choice of the individual coefficients u_t, k_t, v_t, and w_t remains indeterminate.

III. STOCK PRICE VERSUS CASH FLOWS

We begin our analysis with a simplified setting in which the accounting measurement of investments is essentially useless since $\sigma_\eta^2 = \infty$. Alternatively, incentive contracts may be based on GAAP, which requires expensing the investment in question, possibly because they pertain to intangible assets. As a consequence, accounting income reduces to cash flow in this section.

To explore the need for including current or past stock price information in the manager's performance measure, we will focus on memoryless compensation schemes throughout this section. The question then becomes whether P_t must be included in π_t or π_{t+1}, or both. Put differently, we seek to characterize the choice of u_t in $\pi_t = c_t + u_t \cdot P_t + v_t \cdot P_{t-1}$ and that of v_{t+1} in $\pi_{t+1} = c_{t+1} + u_{t+1} \cdot P_{t+1} + v_{t+1} \cdot P_t$. Given the mean-variance representation of the agent's preferences in Lemma 1 and the absence of accounting signals (implying that $k_t = 0$), the agent's incentive compatibility constraints with respect to his effort and investment choices can be represented by the following first-order conditions:

$$\beta_t = e_t'(a_t) \tag{8}$$

and

$$\Gamma_t \cdot m_t'(b_t) = 1. \tag{9}$$

Since the agent's participation constraint will bind at the initial contracting date (i.e., $CE_0 = 0$), the principal chooses managerial effort and investment levels, $\{a_t, b_t\}$, which maximize:

$$\sum_{t=1}^{T} \gamma^t \cdot [a_t - b_t + \gamma \cdot m_t(b_t) - e_t(a_t) - \rho \cdot \beta_t^2 (\sigma_\varepsilon^2 + \Gamma_t^2 \cdot \sigma_\mu^2)] \tag{10}$$

subject to the incentive compatibility conditions in (8) and (9). The intuition for our results will become particularly transparent if the underlying agency problem is *stationary*, i.e., the functions $e_t(\cdot)$ and $m_t(\cdot)$ are time invariant.

Proposition 1: The optimal investment b_t^* is below the first-best level b_t^0. Even for stationary agency problems, optimal performance measures must include stock price, that is $(u_t^*, v_{t+1}^*) \neq 0$.

The principal faces an induced incentive problem with regard to investment decisions, even though investments do not impose a personal cost on the manager. Expressions (9) and (10) show that any investment incentives require an increase in the manager's risk premium beyond $\rho \cdot \beta_t^2 \cdot \sigma_\varepsilon^2$. The incentive problem with regard to b_t reflects that investment and effort decisions effectively cannot be separated. In particular, it is impossible to design a performance measure consisting of two components such that one reflects managerial effort and the other investment expenditures and their returns.

To explain the need for stock price in optimal performance measures, suppose the parties contract only on current cash flow. For a stationary agency problem, the principal seeks to induce the same effort choice in each period, i.e., $\beta_t^* = \beta_{t+1}^*$ for all t. Therefore, the manager internalizes the principal's preferences with regard to investment and chooses b^0. This is reflected in the fact that the aggregate coefficients Γ_t in (6) reduces to γ when $\beta_t^* = \beta_{t+1}^*$ and $u_t = v_{t+1} = 0$. For stationary agency problems, the incentive compatibility condition in (9) simplifies to:

$$\gamma \cdot m'(b_t) = 1,$$

and hence the manager will invest the first-best amount in each period.

The main drawback of a cash-flow-based performance measure is that the manager is fully exposed to the volatility of the investment returns, i.e., the random disturbances $\tilde{\mu}_t$. To minimize the manager's risk exposure and the attendant expected compensation cost, the principal seeks to induce less than the first-best level of investment. To see this, we note from the principal's objective function in (10) that a slight lowering of the aggregate weight Γ_t below γ would lead to a first-order decline in the manager's risk premium, $\Gamma_t^2 \cdot \sigma_\mu^2$, with only a second-order effect on the net present value of the investment, $\gamma \cdot m(b_t) - b_t$. To accomplish this reduction in risk, however, the firm's stock price must be part of the performance measure in every period, that is $(u_t^*, v_{t+1}^*) \neq 0$.

We conclude that in our multiperiod model the firm's stock price plays a dual role: (1) it provides incentives for investment and (2) it serves as an instrument for "filtering out" some of the volatility associated with the investment returns. For instance, by setting $v_t = -(1 + r)$, the manager's performance measure in period $t+1$ will be entirely shielded from the investment risk μ_t. Such "intertemporal" relative performance evaluation is possible provided the market price at date t correctly anticipates the actual return to be received in cash at date $t+1$. In fact, the principal could eliminate the manager's exposure to the investment risk, μ_t, entirely by setting $u_t = 0$ and $v_t = -(1 + r)$. Such a choice of coefficients would, however, eliminate all investment incentives, as can be seen from (6).

It is instructive to contrast our finding in Proposition 1 with the earlier single-period contracting models of Bushman and Indjejikian (1993) and Kim and Suh (1993). In these models, the manager's reward would ideally be based on the firm's terminal cash flow; however, this variable is assumed to be unavailable for contracting, and therefore it becomes essential to rely on stock price. In contrast, the firm's cash flows are available for contracting in our model. With identical bonus parameters, the manager's aggregate performance measure effectively takes the following form:

$$\sum_{t=1}^{T+1} \gamma^t \, [c_t + \hat{u}_t \cdot P_t].$$

The present value $\Sigma_{t=1}^{T+1} \gamma^t \cdot c_t$ represents the amount of shareholder value created over the life of the firm, and is therefore the obvious counterpart to the terminal cash flow variable in a single period setting. Proposition 1 shows that optimal contracts cannot be based on $\Sigma_{t=1}^{T+1} \gamma^t \cdot c_t$ alone (i.e., one cannot set $\tilde{u}_t = 0$) because the stock price anticipates the actual investment return to be delivered in the next period allowing the principal to remove some of the investment risk from the manager's performance measure.[13]

It is also instructive to relate our result in Proposition 1 to the findings of Dutta and Reichelstein (2003). In their multiperiod agency model, the principal can rely on a leading indicator variable that projects future investment returns subject to measurement error. Contrary to our Proposition 1, Dutta and Reichelstein (2003) find that for stationary agency problems the leading indicator variable should receive zero weight and contracts should be conditioned exclusively on delivered cash flows. In our setting, stock price also serves as a leading indicator variable; however, the variability included in this variable is not merely measurement error but instead projects actual cash flow in the subsequent period. As a consequence, P_t is incentive relevant even in a stationary environment.[14]

For nonstationary agency problems one would expect stock price to remain an essential variable. Optimality requires that the performance measure must have minimal variance while satisfying the incentive compatibility conditions. Straightforward but tedious algebra shows that these conditions can "generally" not be satisfied simultaneously if both $u_t = v_{t+1} = 0$. More precisely, this claim holds true except for "knife-edge" configurations of the underlying parameters.

The full commitment scenario considered so far presumes that the manager can commit to stay with the firm even if he might be better off leaving at some intermediate date. We next consider a scenario in which the principal can credibly make long-term commitments, but the agent cannot. A compensation scheme must therefore satisfy the requirement that at each date the discounted sum of the agent's future utility payoffs is least as large as his market alternative. We show that imposing these additional *interim* participation constraints affects neither the principal's expected payoff nor the induced effort and investment choices. The sequential rationality requirement imposed by the interim participation constraints implies that rewards (and penalties) cannot effectively be deferred to later periods. To see this, we recall that the realization of the noise term μ_t is known to all parties at date t. Since μ_t has unbounded support, the interim participation constraints can be satisfied only if the performance measures of periods $t+1$ and thereafter are independent of μ_t. In particular:

$$c_{t+1} + v_{t+1} \cdot P_t \equiv a_{t+1} + \varepsilon_{t+1} + (m_t(b_t) + \mu_t) - b_{t+1} + v_{t+1} \cdot P_t$$

must be independent of μ_t. Thus, $v_{t+1} = -(1 + r)$. Substituting this choice of v_{t+1} into (5), the expression for the market price P_t simplifies to:

$$P_t = \gamma \cdot f_t + K_t. \tag{11}$$

---

[13] An alternative way to view the need for stock price in our model is to envision a one-period multi-task model in which the agent chooses (a_1, a_2, b_1). Assuming the principal cares about a weighted average of the two contractible variables $c_1 = a_1 + \varepsilon_1 - b_1$ and $c_2 + a_2 + m(b_1) + \mu + \varepsilon_2$, more efficient incentive provisions can be implemented by contracting in addition on the variable $f_1 = m_1(b_1) + \mu$. Inclusion of this variable allows for an effective decomposition of the overall "noise" in c_2.

[14] In addition to the difference described here, stock price is also not just a "mechanical" leading indicator variable as in Dutta and Reichelstein (2003). First, inclusion of stock price in the compensation scheme affects price itself. Second, as shown in Section V, with imperfect forecasts of future cash flows, market price will reflect the market's equilibrium beliefs in addition to the imperfect information.

The interim participation constraints require that the lagged stock price exactly offsets the future cash flows from current investments. As a consequence, future cash flows do not generate any investment incentives, but instead such incentives must be generated via the current stock price. As a further implication, the principal's problem becomes intertemporally separable, i.e., the effort level and investment amount for period t can be chosen in a myopically optimal fashion. In particular, the risk-neutral principal's objective for period t is to choose (a_t^*, b_t^*) so as to maximize:

$$\max_{(a_t,b_t)} \{a_t + (\gamma \cdot m_t(b_t) - b_t) - e_t(a_t) - \rho \cdot \beta_t^2 \cdot [\sigma_\varepsilon^2 + u_t^2 \cdot \gamma^2 \cdot \sigma_\mu^2]\} \qquad (12)$$

subject to the incentive compatibility constraints in (8) and (9). A comparison of the above optimization problem with (10) reveals that the principal's contracting problem in (12) is identical to its counterpart in the full-commitment setting, subject to the additional constraints that $v_{t+1} = -(1 + r)$. We recall, however, that for the initial problem with bilateral long-term commitments, the optimal solution to the principal's contracting problem determines only the values of aggregate coefficients Γ_t, whereas the individual values of u_t and v_t remain indeterminate. Imposing the interim participation constraints thus only restricts the degrees of freedom in the class of optimal performance measures.

Corollary to Proposition 1:

(1) The interim participation constraints affect neither the principal's expected payoff nor the induced effort and investment choices.

(2) With interim participation constraints, the optimal weights on market price, relative to the weight on cash flow, are:

$$u_t^* = \frac{1}{\gamma \cdot m_t'(b_t^*)} \qquad (13)$$

and:

$$v_{t+1}^* = -(1 + r). \qquad (14)$$

The interim participation constraints force a clean separation of the two contracting roles that the firm's stock price plays in our model. Current stock price is used to generate investment incentives, while lagged stock price eliminates the uncertainty in the investment returns from the agent's performance measure in the subsequent period.[15]

To conclude this section, we contrast the performance measure derived in the above corollary with the following measure of market value added:[16]

---

[15] It is readily verified that in the current setting of perfect market information long-term commitments by the principal are not essential, i.e., long- and short-term contracts perform equally well. With imperfect market information, however, long-term contracts perform better than short-term contracts because the latter entail additional frictions; see, Christensen et al. (2003) and Dutta and Reichelstein (2003).

[16] Our definition of market value added differs from that in the Value-Based Management literature, where market value added is frequently defined as stock price minus "capital invested" (i.e., book value); see, for instance, Young and O'Byrne (2000).

$$VA_t \equiv P_t + c_t - (1 + r)P_{t-1}.$$

When divided by the beginning of the period stock price, VA_t is equal to the stock's abnormal return. This measure represents the value added for shareholders in period t. In particular, the present value of the VA_t is equal to the present value of all cash flows. Even though the market value added measure captures value creation for shareholders perfectly, the above corollary shows that VA_t is not an optimal performance measure: the coefficient on current stock price should be u_t^*, which is less than 1. The VA_t metric exposes the manager to excessive levels of risk with regard to the uncertain investment returns. This discrepancy between shareholder value creation and optimal performance measurement arises because the random payoffs $\tilde{\mu}_t$ are value-relevant, but they are beyond the manager's control. If it were the case that $\sigma_\mu^2 = 0$, then VA_t would be an optimal performance measure since then $b_t^* = b_t^0$ and, therefore, $u_t^* = 1$. Furthermore, current cash flow would then also be an optimal performance measure provided the underlying agency problem is stationary.

IV. STOCK PRICE VERSUS ACCOUNTING INFORMATION

We now examine optimal performance measures when the accounting system provides an unbiased though noisy estimate of the amount of investments undertaken in each period. For many types of soft investments, it is frequently difficult for the accounting system to separate investment expenditures from current operating expenses. In our model, the resulting noisy measurements of investments are represented by the signals $\tilde{y}_t = b_t + \tilde{\eta}_t$. Following the arguments in the previous section, it can be shown that imposing interim participation constraints changes neither the optimal decisions nor the principal's expected payoff. We thus impose these constraints throughout the remainder of the analysis.

To facilitate the interpretation of optimal performance measures with imperfect accounting information, it will be convenient to express the performance measure as a linear combination of accounting income as well as current and lagged stock price:

$$\pi_t = I_t + u_t \cdot P_t + v_t \cdot P_{t-1}, \tag{15}$$

where income $I_t \equiv c_t + A_t - A_{t-1}$ and asset value A_t at date t is equal to the capitalized current investment $k \cdot y_t$.[17] Since the lagged asset value A_{t-1} is commonly known at date $t-1$ and has unbounded support, the interim participation constraints require that the agent's compensation in period t and thereafter must be independent of A_{t-1}. By definition, accounting income sets the coefficient on A_{t-1} equal to 1, and therefore a performance measure of the form in (15) can satisfy the interim participation constraints only if the fixed payments α_t are allowed to be (linear) functions of A_{t-1}.[18]

The interim participation constraints also require that the performance measures of period t and thereafter must be independent of μ_{t-1}. As before, this requirement can be satisfied by setting $v_{t+1} = -(1 + r)$. As a consequence, the firm's market price P_t in (5) again simplifies to: $P_t = \gamma \cdot f_t + K_t$. Furthermore, the aggregate weight Γ_t on the market signal reduces to $\gamma \cdot u_t$, while the aggregate weight Λ_t on the accounting signal reduces to k_t. The principal thus seeks (a_t^*, b_t^*) that maximize:

---

[17] As mentioned in Section II, A_t is not affected by past investment expenditures because investments have a useful life of one period and are depreciated fully in the period following their capitalization.

[18] In Proposition 3 below, we derive optimal memoryless compensation schemes for which α_t and β_t are independent of the history.

$$\max_{(a_t, b_t)} \{a_t + (\gamma \cdot m_t(b_t) - b_t) - e_t(a_t) - \rho \cdot \beta_t^2 \cdot [\sigma_\varepsilon^2 + u_t^2 \cdot \gamma^2 \cdot \sigma_\mu^2 + k_t^2 \cdot \sigma_\eta^2]\} \tag{16}$$

subject to the incentive compatibility constraints:

$$e_t'(a_t) = \beta_t \tag{17}$$

and:

$$u_t \cdot \gamma \cdot m_t'(b_t) = 1 - k_t. \tag{18}$$

Expressions (16)–(18) show that the two incentive problems become separable in the presence of the interim participation constraints. Effort incentives are driven entirely by the bonus coefficients β_t. These coefficients, in turn, have no bearing on the manager's investment decisions that are determined entirely by the coefficients u_t and k_t inside the performance measure.

Proposition 2: The weight on current market price, relative to the weight on income, in an optimal performance measure is equal to:

$$u_t^* = \frac{1 - k_t^*}{\gamma \cdot m_t'(b_t^*)} \tag{19}$$

with the optimal capitalization rate k_t^* given by:

$$k_t^* = \frac{\sigma_\mu^2}{\sigma_\mu^2 + (m_t'(b_t^*))^2 \cdot \sigma_\eta^2}. \tag{20}$$

The optimal investment, b_t^*, is again below the first-best level, though the investment b_t^* identified in Proposition 2 is larger than that in Proposition 1 because the incentive constraint in (18) is easier to satisfy in the presence of the accounting signal. For given b_t^*, the principal chooses the weights on the current market price, u_t^*, and the optimal capitalization rate, k_t^*, to minimize the overall variance in the manager's performance measure, subject to the two interacting incentive compatibility constraints. We note that the choice of optimal coefficients u_t^* and k_t^* is independent of the underlying moral hazard problem, except through b_t^*, which is affected by the choice of bonus coefficients.[19]

For "hard" investments, like those in property, plant, and equipment, one would expect only negligible measurement errors by the accounting system. Proposition 2 shows that it is then optimal to shield the manager from the investment cost by fully capitalizing the measured investment expenditure, i.e., by setting k_t equal to 1. As a consequence, current stock price is no longer needed to generate investment incentives, though lagged stock price is still required in the following period to filter out the noise in the investment returns.

---

[19] At first glance it may seem surprising that the noisy accounting signal receives a positive weight even for stationary agency problems. The argument here is essentially the one given in connection with the Corollary to Proposition 1: the signal A_t cannot be ignored in order to induce b_t^* with a risk-minimizing performance measure.

When the separation between operating and investment expenditures is subject to measurement errors, reliance on the accounting signal entails a new source of risk for the agent. The expression for the optimal k_t^* in (20) shows that accounting measurement errors calls for *conservative* capitalization in the sense that $0 < k_t^* < 1$. Thus, the observed amount y_t is neither fully capitalized nor fully expensed. The intuition for this result is that with full capitalization the manager would be completely shielded from the investment expenditure and, hence, there would be no further need to include current stock price in the performance measure. Yet, the principal could create identical investment incentives more cheaply by putting a small weight on current stock price. This follows from the fact that the objective function in (16) is quadratic in u_t^* and, hence, the resulting amount of risk is negligible for small values of u_t^*.

The result in Proposition 1 can be used to address the following question. If the nature of the investment is such that GAAP accounting calls for direct expensing, what would be the resulting economic loss, if the firm also were to follow an accounting policy of direct expensing for the purpose of performance evaluation?[20] The above result shows that if the principal were to restrict himself to GAAP accounting income (which would be equal to cash flow) and stock price as performance indicators, there would be more severe underinvestment, i.e., the principal would induce a level of investment below b_t^*. In addition, the manager would be exposed to unnecessary risk, and the principal would have to bear the attendant cost of a higher risk premium.

The preceding discussion suggests that *ceteris paribus* less weight should be placed on stock price if investment returns entail higher volatility. Conversely, one would expect less reliance on accounting income, in particular the noisy asset measures, as investments become "softer." Equations (19) and (20) show that, for a given investment level b_t^*, the optimal capitalization rate indeed increases monotonically in σ_μ^2 and decreases monotonically in σ_η^2. This reasoning is incomplete, however, since both the optimal a_t^* and b_t^* are also functions of the respective noise terms. To simplify the following comparative statics result, we focus on a setting in which the bonus parameter β_t is exogenously fixed at some $0 < \beta_t^* < 1$.[21]

Corollary to Proposition 2: For fixed bonus parameters β_t^*:

(1) the optimal weight on the market price, u_t^*, is decreasing in σ_μ^2.
(2) the optimal capitalization rate, k_t^*, is decreasing in σ_η^2.

A well-known result from single-period agency theory is that for the purpose of optimal performance measurement, multiple signals should be aggregated according to their signal-to-noise ratio, i.e., the relative weight on a signal should be given by its *sensitivity* times its *precision*.[22] In our context, the signals P_t and y_t are included in the manager's performance measure to provide investment incentives rather than effort incentives. Specifically, the sensitivity of the signal P_t is given by:

---

[20] The literature on accounting for intangibles has frequently suggested that there may be substantial economic costs associated with a policy of expensing investments in intangible assets; see, for example, Lev and Sougiannis (1996). In a pure valuation context, these costs appear to be more difficult to capture than in the current management control setting.

[21] This specification may reflect that the marginal cost of effort $e_t'(a_t)$ is equal to β_t^* for $a_t \le a_t^*$, while this marginal cost is prohibitively large for $a_t \ge a_t^*$.

$$\frac{\partial \mathrm{E}[\tilde{P}_t]}{\partial b_t} = \gamma \cdot m_t'(b_t^*),$$

while the sensitivity of the signal y_t is given by:

$$\frac{\partial \mathrm{E}[\tilde{y}_t]}{\partial b_t} = 1.$$

Since $\mathrm{Var}(\tilde{P}_t) = \gamma^2 \cdot \sigma_\mu^2$, $\mathrm{Var}(\tilde{y}_t) = \sigma_\eta^2$, and the precision of a signal is defined to be the inverse of its variance, we find that the relative weight on each signal is indeed proportional to its sensitivity times its precision:

$$\frac{u_t^*}{k_t^*} = \frac{m_t'(b_t^*) \cdot \sigma_\eta^2}{\gamma \cdot \sigma_\mu^2}.$$

The finding that stock price and the noisy asset measure will be aggregated in proportion to their signal-to-noise ratio reflects the force of the interim participation constraints in our multiperiod model. As argued above, these constraints essentially make the principal's problem intertemporally separable and therefore the results obtained in static agency models continue to apply. We note, however, that this conclusion does rely on the market's ability to perfectly anticipate future investment returns. In Section V below that intertemporal separation will no longer obtain once the market's anticipation of future investment payoffs is also subject to measurement errors.

In our analysis so far the firm's stock price has effectively been a "flow" rather than a "stock" variable due to the assumption that the periodic cash flows are paid out to shareholders. We now allow for the possibility that cash flows are partly or fully retained in the business and shareholders receive periodic dividend payments. The literature on equity valuation has long argued that expected future dividends are not an operational criterion for valuing a firm since dividend payments reflect value distribution rather than value creation. Consistent with this view, Ohlson (1999) shows in a multiperiod agency model (in which there is no external capital market) that optimal contracts do not need to depend on dividend payments. Our multiperiod LEN framework allows us to draw the sharper conclusion that optimal performance measures must be invariant to the firm's dividend policy.

Let d_t denote the amount of dividend paid in period t and C_t denote the firm's cash balance at the end of period t. This balance is invested at the interest rate r, and therefore satisfies the relation:

$$C_t = (1 + r) \cdot C_{t-1} + c_t - d_t,$$

with the cash flow c_t given by (1). The firm's book value then becomes $BV_t = C_t + A_t$, and comprehensive income measurement requires that:

---

[22] Banker and Datar (1989) have established this result for a select class of agency problems. Feltham and Xie (1994) provide further characterizations of the optimal weights to be placed on alternative signals in the context of a multi-task LEN-model.

$$I_t = d_t + BV_t - BV_{t-1} = (c_t + A_t - A_{t-1}) + r \cdot C_{t-1}.$$

Accounting income therefore is the sum of operating and financing (or interest) income. As before, the market does not obtain new information from the accruals, i.e., the variable A_t in our setting. However, when cash flows are no longer paid out as dividends, the firm's market price reflects the firm's cash balance in addition to expected future cash flows. Specifically, the firm's market price is now given by:

$$P_t = C_t + \gamma \cdot f_t + K_t,$$

where K_t again is a constant determined by the parameters of the agent's compensation scheme in future periods. In keeping with the LEN framework, we restrict attention to linear dividend policies of the form:

$$d_t = L_t(\mathbf{I}_{t-1}) + \theta_1 \cdot c_t + \theta_2 \cdot A_t, \tag{21}$$

for some linear function $L_t(\mathbf{I}_{t-1})$ and arbitrary coefficients θ_1 and θ_2. This class of dividend policies includes commonly used dividend arrangements such as fixed payout ratios based on current accounting income.

Irrespective of the actual dividend policy, an optimal performance measure must still provide a linear aggregation of the information variables c_t, y_t and k_t such that:

$$\mathrm{E}[\pi_t | f_{t-1}] = a_t - b_t + u_t^* \cdot \gamma \cdot m_t(b_t) + k_t^* \cdot b_t, \tag{22}$$

with u_t^* and k_t^* as given in Proposition 2. Such performance measures can, however, no longer be written as linear combinations of accounting income and stock price since both of these component measures are sensitive to the firm's dividend policy. Intuitively, the principal seeks two component measures, one of which represents the signal f_t available to the market, the other represents the accounting signal y_t, and both component measures are invariant to the actual dividend policy.

The market value added measure introduced in Section III is indeed invariant to the actual dividend policy. Specifically, in our setting the cum-dividend price less the compounded beginning of the period price becomes:

$$VA_t \equiv P_t + d_t - (1 + r) \cdot P_{t-1} = a_t + \varepsilon_t - b_t + \gamma \cdot f_t + K_t - (1 + r) \cdot K_{t-1}.$$

As argued in Section III, VA_t is not an optimal performance measure because it puts too much weight on stock price relative to cash flow. In addition, market value added does not capture the accounting information A_t because for valuation purposes the market does not need to pay attention to the accruals in our setting. To construct a value-added measure based on accounting information, we note that while current accounting income is not affected by current dividends, it does depend on past dividends through the interest income $r \cdot C_t$. Residual income, however, is independent of both current and past dividend payments. Specifically:

$$RI_t = I_t - r \cdot BV_{t-1} = a_t + \varepsilon_t - b_t + f_{t-1} + A_t - A_{t-1} \cdot (1 + r). \tag{23}$$

One drawback of residual income is that it depends on f_{t-1} and A_{t-1}, which conflicts with the interim participation constraints, at least for memoryless compensation schemes.

Accordingly, we consider the following measure of "calibrated" residual income, defined as residual income less the compounded difference between beginning of the period market and book value. Straightforward algebra shows that:

$$RI_t^c = RI_t - (1 + r) \cdot (P_{t-1} - BV_{t-1}) = a_t + \varepsilon_t - b_t + A_t + (1 + r) \cdot K_{t-1}.$$

The following result shows that a properly weighted average of economic value added (i.e., calibrated residual income) and market value added indeed constitutes an optimal performance measure for any dividend policy. Furthermore, this weighted average measure becomes essentially unique if one insists on memoryless compensation schemes. To state the claim formally, two performance measures will be called *equivalent* if one is obtained from the other through an affine transformation, i.e., through the addition and multiplication of constants. Obviously, any claim about uniqueness can only apply to the entire class of equivalent measures.

Proposition 3: Suppose $\{s_t = \alpha_t + \beta_t \cdot \pi_t\}_{t=1}^{T}$ is an optimal memoryless compensation scheme for some dividend policy of the form in (21). Then π_t is equivalent to:

$$\pi_t^* = (1 - u_t^*) \cdot RI_t^c + u_t^* \cdot VA_t \tag{24}$$

with the capitalization rate, k_t^{**}, given by $k_t^{**} = k_t^* / (1 - u_t^*)$, and k_t^* and u_t^* as in Proposition 2.

Consistent with our earlier findings, the optimal π_t^* puts its entire weight on the accounting component, RI_t, if there is no accounting measurement error. In that case, $k_t^* = k_t^{**} = 1$ and $u_t^* = 0$. Conversely, without uncertainty in the future investment returns, we find that $k_t^* = k_t^{**} = 0$ and furthermore $u_t^* = 1$, since in this extreme case $b_t^* = b_t^0$ and $\gamma \cdot m_t' (b_t^0) = 1$. For intermediate values of k_t^* and u_t^*, the resulting capitalization rate k_t^{**} will again be between 0 and 1, thus preserving our earlier finding of conservative accounting.

Proposition 3 takes the firm's dividend policy as arbitrary but fixed. The uniqueness of π_t^* derives from the fact that with memoryless compensation schemes an optimal performance must satisfy (22). We also note that the uniqueness of π_t^* does not imply that the coefficient on current dividends must be zero in an optimal performance measure. It would be possible, for example, to have current dividends proportional to current cash flow and to assign a positive coefficient to dividends. To preserve optimality, however, the other coefficients would then have to be aligned so that the resulting performance measure is equivalent to the convex combination of VA_t and RI_t^c in (24).

Our finding in Proposition 3 is consistent with the empirical results in Bushman et al. (2004) showing that firms place greater value on equity-based incentives as accrual accounting information becomes less reliable. Conversely, we predict that greater volatility in the firm's investment payoffs will *ceteris paribus* result in greater weight being placed on the accounting measure, with the exact weights given by k_t^{**} and u_t^*. Finally, it is instructive to recall the suggestion by Paul (1992) that a possible advantage of accounting income over stock price is that income is a value-added measure, while market price is a stock variable. Our multiperiod model highlights the fact that VA_t is an effective value-added measure. Yet, optimality requires that this value-added measure, based on forward-looking market information, be combined with a backward-looking accounting measure.

V. IMPERFECT MARKET INFORMATION

In the preceding sections, the market was presumed to have perfect foresight about the future payoffs resulting from current investments. This section examines the more realistic scenario in which the market's aggregate information about investment returns is imperfect. For notational simplicity, we first focus on a setting in which the firm's net cash flow is paid out as dividend in each period. To model a market with imperfect information, we represent its information by the realization of a noisy signal about the future cash flows. In particular, the market is assumed to observe the realization of the random variable:

$$\tilde{f}_t = m_t(b_t) + \mu_t + \tilde{\delta}_t. \tag{25}$$

where $\tilde{\delta}_t$ is normally distributed with mean zero and variance σ_δ^2. Unlike the perfect market setting in Sections III and IV, the market no longer directly observes the returns from investments, $m_t(b_t) + \mu_t$. The magnitude of the variance σ_δ^2 represents the market's residual uncertainty about the future investment returns.

In forming expectations regarding next period's cash flows, the market must rely on not only on its signal f_t, but also on its conjecture about the agent's investment choice in the current period. In fact, since the noise term, $\tilde{\delta}_t$, by itself is not value-relevant, the market pays attention to f_t only because it is informative about the realization of μ_t. Let $\hat{b}_t$ denote the market's conjecture about the agent's investment choice in period t. The market rationally anticipates the agent's investment choice, and therefore $\hat{b}_t = b_t^*$, in equilibrium. As before, the market's valuation of the firm is not affected by the asset value A_t. Since $\tilde{\mu}_t$ and $\tilde{\delta}_t$ are normally distributed, the conditional expectation for the future cash inflow is:

$$\mathrm{E}[m_t(\hat{b}_t) + \tilde{\mu}_t | \tilde{f}_t = f_t] = (1 - h) \cdot m_t(\hat{b}_t) + h \cdot f_t, \tag{26}$$

where:

$$h \equiv \frac{\sigma_\mu^2}{\sigma_\mu^2 + \sigma_\delta^2}.$$

Expression (26) shows that the market's expectation for the future cash flows is a weighted average of its noisy signal f_t and its conjecture about the expected investment payoffs $m_t(\hat{b}_t)$. The market puts more weight on its signal as this signal becomes more precise, i.e., h increases in the precision of the market information, $1/\sigma_\delta^2$. Given (26) and a contract of the form in (2)–(3), the firm's market value at date t becomes:

$$P_t = \lambda_t \cdot [(1 - h) \cdot m_t(\hat{b}_t) + h \cdot f_t] + \omega_t \cdot A_t + K_t, \tag{27}$$

where the constant K_t depends on the compensation parameters of future periods, and λ_t and ω_t are identical to the ones derived in connection with Expression (4). To extend Lemma 1 to the imperfect market setting, we note that the interim participation constraints again require that the manager's expected compensation be independent of f_t and y_t in period $t+1$ and thereafter. This again implies that the coefficients on the lagged variables P_{t-1} and A_{t-1} must be zero. The firm's market value at date t thus simplifies to:

$$P_t = \gamma \cdot [(1 - h) \cdot m_t(\hat{b}_t) + h \cdot f_t] + K_t. \tag{28}$$

Lemma 2: If a compensation scheme of the form in (2)–(3) satisfies the interim participation constraints, then the certainty equivalent of the agent's expected utility at date t becomes:

$$\begin{aligned} CE_t(\mathbf{I}_t) = {} & \sum_{i=t+1}^{T} \gamma^{i-t} \cdot \{\mathrm{E}[s_i(\tilde{\pi}_i)|\mathbf{I}_t] - e_i(a_i)\} \\ & - \sum_{i=t+1}^{T} \gamma^{i-t} \cdot \rho \cdot \beta_i^2 \cdot [\sigma_\varepsilon^2 + k_i^2 + \sigma_\eta^2 + u_i^2 \cdot \gamma^2 \cdot h \cdot \sigma_\mu^2 \\ & + (1 - h) \cdot \sigma_\mu^2]. \end{aligned} \tag{29}$$

As before, the certainty equivalent of the agent's expected utility in (29) takes a mean-variance form.[23] Direct comparison shows that the variance term in (29) differs from the corresponding expression in the perfect market setting in two respects. First, the variance term contains an additional component, namely $(1 - h) \cdot \sigma_\mu^2$, which reflects the agent's residual uncertainty regarding the payoffs in the current period from the investment made in the previous period.[24] Second, the variance of the current market price differs from the one in the perfect market setting. With noisy market information, $\mathrm{Var}[\tilde{P}_t] = \gamma^2 \cdot h^2 \cdot (\sigma_\mu^2 + \sigma_\delta^2) = \gamma^2 \cdot h \cdot \sigma_\mu^2$. From the certainty equivalent expression in (29), it follows that the manager will make his investment choice so as to maximize $\mathrm{E}[\tilde{s}_t + \gamma \cdot \tilde{s}_{t+1}|\mathbf{I}_{t-1}]$. Given the expression in (28) and collecting the relevant terms yields the following necessary condition for an interior level of investment, b_t:

$$\beta_t \cdot [-1 + k_t + u_t \cdot \gamma \cdot m_t'(b_t) \cdot h] + \beta_{t+1} \cdot \gamma \cdot [m_t'(b_t) - h \cdot m_t'(b_t)] = 0. \tag{30}$$

The principal again seeks to maximize the stream of future expected cash flows less the cost of effort and the attendant risk premium:

$$\begin{aligned} & \sum_{t=1}^{T} \gamma^t \cdot \{a_t + \gamma \cdot m_t(b_t) - b_t - e_t(a_t)\} \\ & - \sum_{t=1}^{T} \gamma^t \cdot \rho \cdot \beta_t^2 \cdot [\sigma_\varepsilon^2 + k_t^2 \cdot \sigma_\eta^2 + u_t^2 \cdot \gamma^2 \cdot h \cdot \sigma_\mu^2 + (1 - h) \cdot \sigma_\mu^2], \end{aligned} \tag{31}$$

subject to the investment incentive compatibility constraint in (30) and the effort incentive compatibility condition $\beta_t^* = e_t'(a_t)$. In solving the above optimization problem, the principal chooses the induced level of effort a_t, the induced level of investment b_t, the weight on the market price u_t, and the capitalization rate k_t. We note that the principal's optimization problem is no longer intertemporally separable since the incentive compatibility condition in (30) involves β_{t+1}, the bonus parameter in the subsequent period.

---

[23] The arguments underlying Lemma 2 are almost identical to those used in proving Lemma 1, and we therefore omit the proof. We note, though, that when the market had perfect information, it did not matter that the manager was not paid at date $T+1$, since f_t perfectly anticipated the future return. This argument no longer applies with imperfect market information, and it will therefore be convenient to suppose that there is no investment decision in the last period. Thus, $b_T = 0$ and, as a consequence, $P_T = 0$. Alternatively, one could extend the model by allowing for compensation payments at date $T+1$.

[24] This follows from observing that $\mathrm{Var}[\tilde{\mu}_{t-1}|f_{t-1}] = (1 - h) \cdot \sigma_\mu^2$.

Proposition 4: With imperfect market information, the weight on the market price, relative to the weight on income, in an optimal performance is equal to:

$$u_t^* = z_t \cdot \frac{1 - k_t^*}{\gamma \cdot h \cdot m_t'(b_t^*)}$$

with the optimal capitalization rate k_t^* given by:

$$k_t^* = z_t \cdot \frac{\sigma_\mu^2}{\sigma_\mu^2 + h \cdot (m_t'(b_t^*))^2 \cdot \sigma_\eta^2},$$

and:

$$z_t \equiv \left[1 - \gamma \cdot \frac{\beta_{t+1}^*}{\beta_t^*} \cdot (1 - h) \cdot m_t'(b_t^*)\right].$$

The expressions for the optimal weight on current stock price and the optimal capitalization rate are essentially the same as in the perfect market setting, except for the common scaling factor $z_t < 1$. To provide intuition for our finding in Proposition 4, we recall that in the perfect market setting it was optimal to generate the investment incentives exclusively through income and current stock price. With interim participation constraints, the future cash returns from current investment had no incentive effect because they were neutralized by the inclusion of lagged stock price. This "clean" separation of tasks no longer applies when the market receives an imperfect signal of future cash flows.

With imperfect market information, it is no longer possible to shield the manager entirely from the investment payoffs, $m_{t-1}(b_{t-1}) + \mu_{t-1}$, in period t.[25] One consequence of this less precise intertemporal relative performance evaluation is that the rewards tied to future cash flow generate some investment incentives. Specifically, we recall from expression (28) that the market price is a weighted average of its signal f_t, which depends on the manager's *actual* investment choice, and $m_t(\hat{b}_t)$, which depends on the market's *conjecture* $\hat{b}_t$ of the manager's investment choice. From the manager's viewpoint, the expected contribution to his performance measure in the next period equals $(1 - h) \cdot [m_t(b_t) - m_t(\hat{b}_t)]$. Since the manager treats the market's conjecture $\hat{b}_t$ as fixed, his investment choice b_t increases next period's compensation at the rate of $\beta_{t+1}^* \cdot (1 - h) \cdot m_t'(b_t)$. To induce b_t^*, the principal can thus correspondingly reduce the weights on current stock price and the accounting signal.[26]

---

[25] If the market's noisy signal $f_{t-1} = m_{t-1}(b_{t-1}) + \mu_{t-1} + \delta_{t-1}$ were directly available for contracting purposes, the manager's risk exposure would be minimized by putting weight $-h \equiv -\frac{\sigma_\mu^2}{\sigma_\mu^2 + \sigma_\beta^2}$ on the signal f_{t-1}. To see this, note that the optimal weight to filter out the unwarranted noise is given by $-\mathrm{Cov}[\tilde{f}_{t-1}, \mu_{t-1}]/\mathrm{Var}[\tilde{f}_{t-1}] = -h$. Since the market discounts its signal f_{t-1} precisely by the factor h in pricing the firm, the optimal weight on the lagged stock price remains unchanged from that in the perfect market setting, i.e., $-(1 + r)$. Thus, the lagged stock price must receive the same weight as required to satisfy the manager's interim participation constraint, i.e., the current performance measure must be invariant to f_{t-1}.

[26] Comparison of the objective functions in Equations (16) and (31) immediately reveals that the optimal b_t^* in the perfect market setting generally differs from the optimal b_t^* in the imperfect market setting.

Proposition 4 shows that the variance term σ_δ^2, which captures the degree of market imperfection, affects the optimal choice of coefficients u_t^* and k_t^* directly as well as indirectly via the induced action and investment choices. To focus on the direct effect, we consider a specialized setting in which the optimal action and investment choices are invariant to the parameters of the underlying agency problems. In particular, suppose it is optimal to induce $a_t = \bar{a}$ and $b_t = \bar{b}$. The proof of the following result (in the Appendix) provides sufficient conditions for these boundary values to be optimal. For notational convenience, we define $e_t' \equiv e_t'(\bar{a})$, $e_t'' \equiv e_t''(\bar{a})$, and $m_t' \equiv m_t'(\bar{b})$.

Proposition 4′: Suppose it is optimal to induce $a_t = \bar{a}$ and $b_t = \bar{b}$ in each period. Then the weight on market price, relative to the weight on income, in an optimal performance is equal to:

$$u_t^* = \max\{0, z_t\} \cdot \frac{1 - k_t^*}{\gamma \cdot h \cdot m_t'},$$

with the optimal capitalization rate k_t^* given by:

$$k_t^* = \max\{0, z_t\} \cdot \frac{\sigma_\mu^2}{\sigma_\mu^2 + h \cdot (m_t')^2 \cdot \sigma_\eta^2}$$

and

$$z_t \equiv \left[1 - \gamma \cdot \frac{e_{t+1}'}{e_t'} \cdot (1 - h) \cdot m_t'\right].$$

With the desired effort and investment levels held fixed, it may be optimal to set both u_t^* and k_t^* equal to zero. In contrast, Proposition 2 established that an optimal performance measure always puts positive weights on both the accounting information and the market price. The reason for this difference is that with imperfect market information an optimal performance measure effectively returns $(1 - h) \cdot m_{t-1}(b_{t-1})$ in period t for the investment expenditure b_{t-1} made in period $t-1$. Consequently, if the market information is sufficiently imprecise (i.e., $(1 - h)$ is sufficiently large) and the bonus parameters across two consecutive periods are properly aligned, it will not be necessary to rely on current stock price or accounting information to induce the optimal investment decision.

Corollary to Proposition 4′:

(1) The optimal weight on the market price, u_t^*, is decreasing (increasing) in the precision of the market information, if e_{t+1}'/e_t' is below (above) a certain threshold level.

(2) Relative to the optimal weight on the market price, the optimal capitalization rate, k_t^*, remains constant in the precision of the market information.

It may appear counterintuitive at first that the principal wants to rely more, rather than less, on market price as market information becomes less precise. It should be kept in mind, though, that lower precision of the market's information has two opposing effects on the optimal coefficient u_t^*. First, the market relies more on its equilibrium beliefs about the agent's investment choice and less on its information about the actual investment choice, as market information becomes less precise. As a consequence, stock price becomes a less powerful instrument for inducing investment incentives, and therefore the principal needs to increase u_t^* in order to induce a given investment choice. Second, however, next period's performance measure becomes a more powerful incentive device as the market information becomes less precise. This effect will tend to lower the principal's reliance on the current market price in providing investment incentives. The expression for z_t shows that the magnitude of this second effect depends on the relative magnitudes of the bonus coefficients in periods t and $t+1$. When e'_{t+1}/e'_t is relatively small, the first effect dominates in the sense that u_t^* increases as the market information becomes less precise. On the other hand, when e'_{t+1}/e'_t is relatively large, the second effect dominates, and the optimal weight on the market price decreases as the precision of the market information declines.

The result that the ratio k_t^*/u_t^* remains constant in σ_δ^2 also appears counterintuitive at first sight. One might have expected that the principal would rely more on accounting information as market price becomes a less precise indicator of future cash flows. We recall, however, that the investment incentive is determined by the *effective* weight on the market signal f_t, i.e., $u_t^* \cdot h \cdot \gamma$, rather than by the *nominal* weight on the market price, i.e., u_t^*. While the ratio k_t^*/u_t^* remains constant, the ratio of the effective weights $k_t^*/(u_t^* \cdot h \cdot \gamma)$ increases as the market information becomes less precise. Put differently, the sensitivity of the market price, as given by $\gamma \cdot h \cdot m'_t$, declines as the market information becomes less precise. At the same time, however, the precision of the market price, as given by $(\gamma^2 \cdot \sigma_\mu^2 \cdot h)^{-1}$, improves because the market relies less on its own signal in pricing the firm. These two effects offset each other exactly, and the relative weights on the two signals remain unchanged.

Throughout the preceding analysis investment-related cash inflows were assumed to be uncertain, i.e., $\sigma_\mu^2 > 0$. In the limited case of a deterministic return relationship (i.e., $\sigma_\mu^2 = 0$), the market can perfectly predict the agent's "equilibrium" investment choice without relying on its noisy signal, $f_t = m_t(b_t) + \delta_t$. Consequently, the market signal becomes irrelevant for valuation purposes even though it is incrementally informative about the agent's investment choice.[27] Since the firm's market price only depends on the agent's conjectured but not his actual investment choice, market price becomes useless for incentive purposes and therefore the optimal weight u_t^* will be indeterminate. However, with some uncertainty, no matter how small, in the investment return relationship, the market signal becomes useful for forecasting future cash flows and the optimal u_t^* is determined uniquely as given in Proposition 4′.

In concluding this section, we note that our main results in Section IV on alternative dividend policies remains essentially unchanged when the market's signal of future investment returns, f_t, is subject to random disturbances. The coefficients u_t^* and k_t^* in Proposition 3 must then be chosen as in Proposition 4. As a consequence, it can no longer be guaranteed that the coefficients u_t^*, k_t^*, and k_t^{**} are between 0 and 1.

---

[27] A similar result is obtained in Kanodia et al. (2004), where the market ignores a noisy measure of investment in pricing the firm. Bagwell (1995) obtains a related conclusion in a leader-follower oligopoly setting.

VI. CONCLUSION

In a multiperiod agency setting we have examined the role of stock price and accounting information in managerial performance measures. From an incentive perspective, stock price and accounting data provide fundamentally different types of information. While stock price is forward-looking, accounting information is historical or backward-looking. The drawback of stock price as a performance indicator is that it must reflect all value-relevant factors even if some of those factors are beyond the manager's control. If investment expenditures, as measured by the accounting system, are properly capitalized, accounting income also generates desirable investment incentives since the manager's current performance measure is shielded from investments by "deferring" the associated expenditures to future periods. To the extent that the separation of investment and operating expenditures is subject to measurement errors, however, accounting income is also an imperfect indicator.

Our analysis establishes that in addition to actual cash flows an optimal performance measure must rely on both accounting variables and stock price. The familiar performance metrics of market value added and economic value added (residual income) are useful for calibrating stock price and accounting income to the relevant history, in particular to the firm's dividend policy. Our results yield predictions about the relative weights to be placed on these two component measures, depending on the accounting measurement errors and the variability in the firm's investment payoffs.

Some of our comparative statics results on the relative use of market versus accounting information appear counterintuitive at first. In particular, the relative weight on stock price may increase as the market receives less precise information about the firm's future cash flows. Furthermore, our analysis shows that when the market's information becomes more precise, the principal will not necessarily rely more on accounting information. These findings may prove useful in future empirical work that seeks to link the use of stock price in managerial compensation schemes to the characteristics of different investments, firms, and industries.

Our analysis suggests several promising directions for future research. First, it would be desirable to expand the model so as to allow managers to have better information about investment projects than owners. In such a setting the market is then also likely to have better information about the future profitability of the firm's investments than the owners. As a consequence, stock price can assume an additional stewardship role that is to bridge the information asymmetry between owners and management. Second, our analysis has focused on managerial decisions while taking the information reported by the accounting system as given. It would seem natural to extend our line of inquiry by allowing managers some control over the accounting reports. This would naturally introduce notions of "earnings management" into our multiperiod framework.[28] Finally, the analysis in this paper has focused on a single manager. Many firms seem to use stock price as a firm-wide performance metric and combine it at the divisional level with divisional accounting metrics. Such compensation practices appear to balance complex trade-offs between long-term performance incentives, coordination across divisions, and risk sharing. The theoretical foundations of such practices have not been examined in sufficient detail, particularly for dynamic incentive problems.[29]

---

[28] There are multiple ways of introducing "earnings management" into our contracting model, possibly along the lines of Ewert and Wagenhofer (2004) or Dye and Sridhar (2004).

[29] See Bushman et al. (1995) and Anctil and Dutta (1999) for some analysis on the use of corporate versus divisional performance measures.

APPENDIX
Summary of Notation

Symbol	Description
c_t	Aggregate cash flows in period t
a_t	Manager's action in period t
b_t	Investment expenditures in period t
$m_t\,(b_t) + \tilde{\mu}_t$	Cash flows from investment made in period t
σ_{μ}^2	$\mathrm{Var}(\tilde{\mu}_t)$
f_t	Date t market signal of investment payoffs arriving in period $t+1$
$\tilde{\delta}_t$	Noise in the market signal
$\tilde{\varepsilon}_t$	Operating risk
y_t	Accounting measure of investment in period t; $y_t = b_t + \tilde{\eta}_t$
$\tilde{\eta}_t$	Accounting measurement error
A_t	Asset value at date t; $A_t = k_t \cdot y_t$
k_t	Capitalization rate in period t
s_t	Compensation in period t
α_t	Fixed salary in period t
β_t	Bonus Coefficient for period t
π_t	Performance measure for period t
u_t	Weight on current price in period t
v_t	Weight on lagging price in period t
Γ_t	Effective aggregate weight on market signal f_t
Λ_t	Effective aggregate weight on accounting signal y_t
$\mathbf{I}_t$	Informational variables available for contracting at date t
P_t	Ex-dividend market price at date t
r	Interest rate
γ	Discount factor, i.e., $(1 + r)^{-1}$
$\hat{\rho}$	Manager's coefficient of absolute risk aversion
ρ	$\frac{1}{2} \cdot \hat{\rho} \cdot (1 - \gamma)$
$e_t(a_t)$	Manager's disutility of effort in period t
CE_t	Certainty equivalent of the manager's future utility at date t
d_t	Dividends in period t
RI_t	Residual income in period t
RI_t^c	Calibrated residual income in period t
VA_t	Market value added in period t

Proof of Lemma 1

Step 1: We first derive the expression for the equilibrium market price, given a linear compensation scheme of the form in (2)–(3).

Proof of Step 1

We note that $P_T = \gamma \cdot f_T$, which is consistent with Expression (5) because $\beta_{T+1} = 0$. The market price at date $T-1$ is given by:

$$P_{T-1} = \gamma \cdot \mathrm{E}[a_t + \tilde{\varepsilon}_T - b_T + f_{T-1} - s_T\,(\tilde{\pi}_T) | \mathbf{I}_{T-1}^{-}, f_{T-1}].$$

Substituting $\pi_T = c_T + A_T + w_T \cdot A_{T-1} + u_T \cdot P_T + v_T \cdot P_{T-1}$ and solving for P_{T-1} yields:

$$P_{T-1} = \lambda_{T-1} \cdot f_{T-1} + \omega_{T-1} \cdot A_{T-1} + K_{T-1}$$

where λ_{T-1} and ω_{T-1} are as defined in connection with (5), and K_{T-1} is a constant depending on α_T, β_T and υ_T. For arbitrary t, expression (5) follows by induction.

Step 2: If $P_t\ (f_t) = \lambda_t \cdot f_t + \omega_t \cdot A_t + K_t$, for arbitrary coefficients K_t, λ_t and ω_t, and the agent's linear compensation scheme is of the form $s_t = \alpha_t + \beta_t\ [c_t + A_t + w_t \cdot A_{t-1} + u_t \cdot P_t + \upsilon_t \cdot P_{t-1}]$, then the certainty equivalent of the agent's expected future utility at date t is given by:

$$CE_t\ (\mathbf{I}_t) = \sum_{i=t+1}^{T} \gamma^{i-t} \cdot \{E[s_i\ (\tilde{\pi}_i)|\mathbf{I}_t] - e_i(a_i) - \rho \cdot RP_i\},$$

with the risk premium, given RP_i given by:

$$RP_i \equiv \beta_i^2 \cdot [\sigma_\varepsilon^2 + \Gamma_i^2 \cdot \sigma_\mu^2 + \Lambda_i^2 \cdot \sigma_\eta^2].$$

Proof of Step 2

The agent's consumption planning problem can be solved by backward induction. Given the realization of the investment return f_t in period t, the agent chooses his savings at date t optimally. Since he can borrow and lend at the interest rate r, his consumption at date t is given by:

$$\phi_t = s_t + (1 + r) \cdot W_{t-1} - W_t$$

provided his date t savings are W_t. With exponential utility and normally distributed noise terms, the agent's expected utility at date t can be expressed as:

$$EU_t = -\frac{1}{r} \cdot \exp\{-\rho \cdot r \cdot (W_t + CE_t)\}$$

with the certainty equivalent CE_t determined by:

$$CE_t\ (\mathbf{I}_t) = \gamma\{E[\tilde{s}_{t+1} + CE_{t+1}\ (\tilde{\mathbf{I}}_{t+1})|\mathbf{I}_t] - e_t(a_t) - \rho \cdot \mathrm{Var}[\tilde{s}_{t+1} + CE_{t+1}\ (\tilde{\mathbf{I}}_{t+1})|\mathbf{I}_t]\}.$$

For details the reader is referred to Dutta and Reichelstein (1999, Lemma 1). The claim then follows immediately by induction after noting that:

$$\mathrm{Var}[\tilde{s}_{t+1} + CE_{t+1}\ (\tilde{\mathbf{I}}_{t+1})|\mathbf{I}_t] = \sum_{i=t+1}^{T} \gamma^{i-(t+1)} \cdot RP_i. \qquad \blacksquare$$

Proof of Proposition 1

We recall that the principal's contracting problem is to choose $\{a_t, b_t\}$ so as to maximize (10), subject to the incentive compatibility conditions in (8) and (9). To demonstrate that $b_t^* < b_t^0$, we note that $b_t^0 \in \operatorname{argmax}_{b_t} \{\gamma \cdot m_t(b_t) - b_t\}$, while:

$$b_t^* \in \operatorname{argmax}_{b_t}\left\{\gamma \cdot m_t(b_t) - b_t - \rho \cdot \beta_t^2 \cdot \frac{1}{\gamma \cdot m_t'(b_t)}\right\}.$$

Since $\frac{1}{\gamma \cdot m_t'(b_t)}$ is increasing in b_t, it follows that $b_t^* < b_t^0$.

To complete the proof, we need to show that $(u_t, v_{t+1}) = 0$ cannot be optimal even when the agency problem is stationary. Contrary to the claim, suppose the agency problem is stationary, i.e., $m_t(\cdot)$ and $e_t(\cdot)$ are time invariant, and $(u_t, v_t) = 0$ is part of an optimal performance measure. Equation (6) yields:

$$\Gamma_t = \gamma \cdot \frac{\beta_{t+1}^*}{\beta_t^*} = \gamma$$

since $\beta_{t+1}^* = \beta_t^*$ for a stationary agency problem. It then follows from the incentive compatibility condition in (9) that the manager will choose $b_t = b_t^0$ in each period, contradicting that the optimal investment satisfies $b_t^* < b_t^0$. ■

Proof of Corollary to Proposition 1

As argued in the text, the interim participation constraints require that $v_{t+1} = -(1 + r)$. As a consequence, the expression for the aggregate weight on the market signal simplifies to $\gamma \cdot u_t$ and (13) follows from the agent's incentive compatibility condition in (9).

To complete the proof, it remains to show that for any choice of $(\beta_1,\ldots,\beta_T)$ and $(u_1,\ldots,u_T)$ the principal can choose the fixed payments $(\alpha_1,\ldots,\alpha_T)$ so as to satisfy the interim participation constraints at date t, i.e., $CE_t \geq 0$. Direct substitution shows that:

$$P_{T-1} = \gamma \cdot f_{T-1} - \frac{\gamma}{1 - \beta_T} \cdot \alpha_T + \gamma \cdot \hat{a}_t(\beta_T),$$

where $\hat{a}_t\,(\beta_T)$ is the effort level induced by β_T, i.e. $\beta_T \equiv e_T'\,(\hat{a}_t\,(\beta_T))$. Therefore:

$$\begin{aligned} E[\tilde{s}_T | f_{T-1}] &= \alpha_T + \beta_T \cdot (a_T + f_{T-1} + v_{T1} \cdot P_{T-1}(f_{T-1})) \\ &= \alpha_T + \beta_T \cdot \left[a_T + \frac{1}{1 - \beta_T}\,\alpha_T - \hat{a}_T\,(\beta_T)\right]. \end{aligned}$$

For any β_T the principal can thus choose α_T so that the agent's participation constraint in period T is satisfied with equality. For period $T-1$, the beginning of the period price is given by:

$$P_{T-2} = \gamma \cdot f_{T-2} - \frac{\gamma}{1 - \beta_{T-1}}\,\alpha_{T-1} + K_{T-1}',$$

where K_{T-1}' is a constant depending on β_{T-1}, u_{T-1}, α_T, and β_T. Thus:

$$\begin{aligned} E[\tilde{s}_{T-1} | f_{T-2}] = \alpha_{T-1} + \beta_{T-1} \cdot \Bigg[& a_{T-1} - b_{T-1} + u_{T-1} \cdot \gamma \cdot m_{T-1}(b_{T-1}) \\ & + \frac{1}{1 - \beta_{T-1}}\,\alpha_{T-1} - \frac{1}{\gamma}\,K_{T-1}' \Bigg]. \end{aligned}$$

We conclude that for any β_{T-1}, u_{T-1}, β_T, and α_T, the principal can choose α_{T-1} to satisfy the agent's participation constraint with equality in period $T-1$. Proceeding inductively, it follows that the fixed payments α_t can be chosen so as to satisfy the participation constraint in each period with equality. ■

Proof of Proposition 2

For the agent to be willing to stay with the firm at the beginning of period $t+1$, his performance measure in period $t+1$ must be independent of the noise terms μ_t and η_t. This is equivalent to the condition that $c_{t+1} + w_{t+1} \cdot A_t + v_{t+1} \cdot P_t$ be independent of f_t and A_t. Since $c_{t+1} = a_{t+1} + \varepsilon_{t+1} + f_t - b_t$, it follows that $\lambda_t \cdot v_{t+1} = -1$, or $v_{t+1} = -(1 + r)$. Similarly, the requirement that the period t performance measure be constant in A_t implies that $w_{t+1} = 0$. As a result, the aggregate weight on the accounting signal, Λ_t, becomes equal to the capitalization rate k_t, while the aggregate weight on the market signal, Γ_t, simplifies to $u_t \cdot \gamma$.

To implement any given a_t^* and b_t^*, the bonus coefficient β_t must be chosen so that $\beta_t = e_t'(a_t^*)$ and the coefficients k_t and u_t must satisfy the incentive compatibility constraint in (18). For any given b_T^*, the principal will choose k_t and u_t to minimize the total variance:

$$k_t^2 \cdot \sigma_\eta^2 + \gamma^2 \cdot u_t^2 \cdot \sigma_\mu^2. \tag{32}$$

Substituting (18) into the objective function in (32), one obtains the first-order condition for the optimal u_t^*:

$$u_t^* = \frac{\sigma_\eta^2 \cdot m_t'(b_t^*)}{\gamma[\sigma_\mu^2 + (m_t'(b_t^*))^2 \cdot \sigma_\eta^2]}.$$

Since:

$$u_t^* = \frac{1 - k_t^*}{\gamma \cdot m_t'(b_t^*)},$$

it follows that:

$$k_t^* = \frac{\sigma_\mu^2}{\sigma_\mu^2 + (m_t'(b_t^*))^2 \cdot \sigma_\eta^2}.$$

To demonstrate that $b_t^* < b_t^0$, we note that $b_t^0 \in \operatorname{argmax}_{b_t} \{\gamma \cdot m_t(b_t) - b_t\}$, while $b_t^* \in \operatorname{argmax}_{b_t} \{\gamma \cdot m_t(b_t) - b_t - \rho \cdot \beta_t^2 \cdot V_t(b_t)\}$, where:

$$V_t(b_t) \equiv (k_t^*(b_t))^2 \cdot \sigma_\eta^2 + \gamma^2 \cdot (u_t^*(b_t))^2 \cdot \sigma_\mu^2 = \frac{\sigma_\mu^2 \cdot \sigma_\eta^2}{\sigma_\mu^2 + (m_t'(b_t))^2 \cdot \sigma_\eta^2}.$$

Since $V_t(\cdot)$ is increasing in b_t, it follows that $b_t^* < b_t^0$. As in the proof of Corollary to Proposition 1, the fixed payments α_t can be chosen so as to meet the manager's interim participation constraints. ■

Proof of Corollary to Proposition 2

The incentive compatibility constraint for any investment, b_t, is $u_t \cdot \gamma \cdot m_t'(b_t) = (1 - k_t)$. We can therefore restate the principal's objective as:

$$B(u_t, k_t) - \rho \cdot \beta_t^2 \cdot [u_t^2 \cdot \gamma^2 \cdot \sigma_\mu^2 + k_t^2 \cdot \sigma_\eta^2],$$

where $B(u_t, k_t)$ denotes the present value of cash flows corresponding to the level of b_t induced by u_t and k_t. Thus, the marginal cost of u_t is increasing in σ_μ^2 and the marginal cost of k_t is increasing in σ_η^2. A revealed preference argument then shows that k_t^* is decreasing in σ_η^2, while u_t^* is decreasing in σ_μ^2. ■

Proof of Proposition 3

We first demonstrate the sufficiency part, i.e., the performance measure, π_t^*, is indeed optimal for a memoryless compensation scheme. As argued in the text:

$$VA_t = a_t + \varepsilon_t - b_t + \gamma \cdot f_t + K_t - (1 + r) \cdot K_{t-1}$$

and:

$$RI_t^c = a_t + \varepsilon_t - b_t + k_t^{**} \cdot y_t + K_{t-1}.$$

Thus, if $k_t^{**} = k_t^*/(1 - u_t^*)$, we obtain:

$$\begin{aligned}\pi_t^* &= (1 - u_t^*) \cdot RI_t^c + u_t^* \cdot VA_t \\ &= a_t + \varepsilon_t - b_t + k_t^* \cdot y_t + u_t^* \cdot \gamma \cdot f_t + \Delta\end{aligned}$$

where Δ denotes a constant depending on u_t^*, K_t, and K_{t-1}. Proposition 2 now shows that for suitably chosen constants α_t and β_t, $\{s_t = \alpha_t + \beta_t \cdot \pi_t^*\}_{t=1}^T$ is an optimal incentive scheme that satisfies the interim participation constraints.

To demonstrate necessity, we note that any performance measure π_t, which can be written as a linear combination of $\{c_\tau, P_\tau, A_\tau, d_\tau, C_\tau\}$ for $\tau = t$ and $\tau = t - 1$ can be rewritten as:

$$\begin{aligned}\pi_t = {} & x_t^c \cdot (a_t + \varepsilon_t - b_t) + x_t^f \cdot \gamma \cdot f_t + x_t^y \cdot k_t \cdot y_t + x_{t-1}^c \cdot (a_{t-1} + \varepsilon_{t-1} - b_{t-1}) \\ & + x_{t-1}^f \cdot \gamma \cdot f_{t-1} + x_{t-1}^y \cdot k_{t-1} \cdot y_{t-1} + \ldots + x_1^c \cdot (a_1 + \varepsilon_1 - b_1) + x_1^f \cdot \gamma \cdot f_1 \\ & + x_1^y \cdot k_1 \cdot y_1.\end{aligned}$$

The above expression reflects that each of the variables c_t, P_t, C_t, A_t, and d_t can be expressed as linear combinations of the "carrier" variables $(a_\tau + \varepsilon_\tau - b_\tau)$, f_τ, and $k_\tau \cdot y_\tau$ for $1 \leq \tau \leq t$, with the coefficients x_τ^c, x_τ^f and x_τ^y representing the aggregate coefficients on these carrier variables.

To satisfy the interim participation constraints with a memoryless compensation scheme, all coefficients x_τ^c, x_τ^f, and x_τ^y must be equal to zero for $\tau \leq t - 1$. To induce the optimal b_t^* and minimize the manager's risk exposure, an optimal performance measure must be equivalent to:

$$(a_t + \varepsilon_t - b_t) + u_t^* \cdot \gamma \cdot f_t + k_t^* \cdot y_t.$$

Therefore, $x_t^f/x_t^c = u_t^*$ and $(x_t^y \cdot k_t)/x_t^c = k_t^*$, proving our claim. ■

Proof of Proposition 4

In order to induce a_t^*, the bonus parameter has to be chosen such that $\beta_t^* = e_t'(a_t^*)$ for each t. For a given choice of a_t^*, a_{t+1}^*, and b_t^*, the principal chooses the coefficients u_t and k_t to minimize the variance:

$$k_t^2 \cdot \sigma_\eta^2 + u_t^2 \cdot \gamma^2 \cdot h \cdot \sigma_\mu^2 \tag{33}$$

subject to the incentive compatibility constraint in (30). We therefore substitute (30) into the principal's objective function in (33). The expression for the optimal k_t^* then follows from the principal's first-order condition, while the expression for the optimal u_t^* follows from the incentive compatibility constraint in (30). Like in Proposition 2, the fixed payments $\{\alpha_t\}$ can be so chosen as to meet the manager's interim participation constraints, i.e., the manager would not want to quit at the beginning of period $t+1$ provided he has invested b_t^*. Furthermore, the fixed payments can be "backloaded" so that the manager never would have an incentive to underinvest at date t, and subsequently quit his job. ■

Proof of Proposition 4′

The principal chooses the optimal effort a_t and the optimal investment b_t to maximize:

$$\gamma \cdot m_t(b_t) - b_t + a_t - e_t(a_t) - \rho \cdot e_t'(a_t) \\ \cdot [\sigma_\varepsilon^2 + (k_t^*)^2 \cdot \sigma_\eta^2 + (u_t^*)^2 \cdot \gamma^2 \cdot h \cdot \sigma_\mu^2 + (1-h) \cdot \sigma_\mu^2]$$

where u_t^* and k_t^* are as given in Proposition 3. We first provide sufficient conditions to ensure that the principal always finds it optimal to induce the maximum effort $a_t = \bar{a}$ and the maximum investment $b_t = \bar{b}$. For notational convenience, let $e_t' \equiv e_t'(\bar{a})$, $e_t'' \equiv e_t''(\bar{a})$, and $m_t' \equiv m_t'(\bar{b})$. In order to induce $a_t = \bar{a}$, the principal will set $\beta_t^* = e_t'$ in each period. It will be optimal to induce $a_t = \bar{a}$ and $b_t = \bar{b}$ in each period provided $m_t''(\cdot)$ is decreasing, $e_t''(\cdot)$ is increasing, and the following conditions hold:

$$\gamma \cdot m_t' - 1 - 2 \cdot \rho \cdot (e_t')^2 \cdot \left[\sigma_\eta^2 \cdot \frac{\sigma_\mu^2 + 3 \cdot (m_t')^2 \cdot \sigma_\eta^2}{m_t' \cdot \sigma_\mu^2}\right] > 0; \tag{34}$$

$$1 - e_t' - 2 \cdot \rho \cdot e_t' \cdot e_t'' \cdot (\sigma_\varepsilon^2 + \sigma_\eta^2 + \sigma_\mu^2) > 0. \tag{35}$$

To see this, we differentiate the principal's objective function above with respect to a_t. If $e_t''(\cdot)$ is increasing and condition (35) holds, the above objective function is strictly increasing in a_t. Similarly it can be verified that the principal's objective function is increasing in b_t provided that condition (34) holds and $m_t'''(\cdot) \leq 0$. This shows that conditions (34) and (35) are sufficient to ensure that the optimal action and investment choices are $a_t = \bar{a}$ and $b_t = \bar{b}$, respectively.

To induce $a_t = \bar{a}$, the bonus parameters have to satisfy:

$$\beta_t^* = e_t'.$$

The manager will choose $b_t = \bar{b}$ provided that:

$$u_t \geq z_t \cdot \frac{1 - k_t}{\gamma \cdot h \cdot m_t'} \tag{36}$$

where:

$$z_t \equiv 1 - \gamma \cdot (1 - h) \cdot m' \cdot \frac{e_{t+1}'}{e_t'}.$$

The principal chooses the coefficients u_t and k_t to minimize:

$$k_t^2 \cdot \sigma_\varepsilon^2 + h \cdot \gamma^2 \cdot \sigma_\mu^2 + u_t^2 \tag{37}$$

subject to the incentive compatibility constraints in (36). Note that if $u_t < 0$ satisfies the incentive compatibility constraint in (36), then $u_t = 0$ will also satisfy it. Consequently, $u_t < 0$ cannot be optimal. Furthermore, (36) will optimally hold as an equality whenever $u_t > 0$. As a result:

$$u_t^* = \max\left\{0, z_t \cdot \frac{1 - k_t^*}{\gamma \cdot h \cdot m_t'}\right\}. \tag{38}$$

Substituting (38) into (37) and optimizing with respect to k_t^* yields:

$$k_t^* = \max\{0, z_t\} \cdot \frac{\sigma_\mu^2}{\sigma_\mu^2 + h \cdot (m_t')^2 \cdot \sigma_\eta^2}.$$

Substitution of the above equation into (38) gives:

$$u_t^* = \max\{0, z_t\} \cdot \frac{m_t' \cdot \sigma_\eta^2}{\gamma \cdot [\sigma_\mu^2 + h \cdot (m_t')^2 \cdot \sigma_\eta^2]}. \tag{39}$$

Proof of Corollary to Proposition 4′

When $u_t^* > 0$, we differentiate (39) with respect to σ_δ^2 and, after simplifying, obtain:

$$\text{Sign}\left[\frac{\partial u_t^*}{\partial \sigma_\delta^2}\right] = \text{Sign}\left[u_t^* - \frac{e_{t+1}^*}{e_t^*}\right].$$

This proves part (i). Combining the expressions for k_t^* and u_t^* in the Proof of Proposition 4′ yields:

$$k_t^* = \frac{\gamma \cdot \sigma_\mu^2}{m_t' \cdot \sigma_\eta^2} \cdot u_t^*,$$

which proves that the ratio k_t^*/u_t^* is independent of σ_δ^2. ■

REFERENCES

Anctil, R., and S. Dutta. 1999. Negotiated transfer pricing and divisional versus firm-wide performance measures. *The Accounting Review* 74 (1): 87–104.

Bagwell, K. 1995. Commitment and observability in games. *Games and Economic Behavior* 8 (2): 271–280.

Banker, R., and S. Datar. 1989. Precision, sensitivity and linear aggregation of signals for performance evaluation. *Journal of Accounting Research* 27 (1): 21–39.

Bushman, R., and R. Indjejikian. 1993. Accounting income, stock price and managerial compensation. *Journal of Accounting and Economics* 16 (1-3): 3–24.

———, ———, and A. Smith. 1995. Aggregate performance measures in business unit manager compensation: The role of intrafirm dependencies. *Journal of Accounting Research* 33 (Supplement): 101–128.

———, Q. Chen, E. Engle, and A. Smith. 2004. Financial accounting information, organizational complexity and corporate governance systems. *Journal of Accounting and Economics* 37 (2): 139–165.

Christensen, P., G. Feltham, and F. Sabac. 2003. Dynamic incentives and responsibility accounting: A comment. *Journal of Accounting and Economics* 35 (3): 423–436.

Core, J., W. Guay, and R. Verrecchia. 2003. Price versus non-price performance measures in optimal compensation contracts. *The Accounting Review* 78 (4): 957–982.

Dikolli, S. 2001. Agent employment horizons and contracting demand for forward-looking performance measures. *Journal of Accounting Research* 39 (3): 481–494.

Dutta, S., and S. Reichelstein. 1999. Asset valuation and performance measurement in dynamic agency settings. *Review of Accounting Studies* 4 (3-4): 235–289.

———, and ———. 2003. Leading indicators, performance measurement and long-term versus short-term contracts. *Journal of Accounting Research* 41 (5): 837–866.

Dye, R., and S. Sridhar. 2004. Reliability-relevance tradeoffs and the efficiency of aggregation. *Journal of Accounting Research* 42 (1): 51–88.

Ewert, R., and A. Wagenhofer. 2004. Economic effects of tightening standards to restrict earnings management. Working paper, University of Graz.

Feltham, G., and J. Xie. 1994. Performance measure congruity and diversity in multi-task principal/agent relations. *The Accounting Review* 69 (3): 429–453.

———, and M. Wu. 2000. Public reports, information acquisition by investors and management incentives. *Review of Accounting Studies* 5 (2): 155–190.

Ittner, C., R. Lambert, and D. Larcker. 2003. The structure and performance consequences of equity grants to employees of new economy firms. *Journal of Accounting and Economics* 34 (1-3): 89–127.

Jensen, M., and K. Murphy. 1990. Performance pay and top management incentives. *Journal of Political Economy* 98 (2): 225–264.

Kanodia, C., and A. Mukherji. 1996. Real effects of separating investment and operating cash flow. *Review of Accounting Studies* 1 (1): 51–72.

———, R. Singh, and A. Spero. 2004. Imprecision in accounting measurements: Can it be value enhancing? Working paper, University of Minnesota.

Kim, O., and Y. Suh. 1993. Incentive efficiency of compensation based on accounting and market Performance. *Journal of Accounting and Economics* 16 (1-3): 25–54.

Lambert, R., and D. Larcker. 1987. An analysis of the use of accounting and market measures of performance in executive compensation contracts. *Journal of Accounting Research* 25 (Supplement): 85–125.

Lev, B., and T. Sougiannis. 1996. The capitalization, amortization and value-relevance of R&D. *Journal of Accounting and Economics* 21 (1): 107–138.

Ohlson, J. 1999. Earnings, book values and dividends in a stewardship setting with moral hazard. *Contemporary Accounting Research* 16 (3): 524–540.

Paul, J. 1992. On the efficiency of stock-based compensation. *Review of Financial Studies* 5 (3): 471–502.

Rappaport, A. 1999. New thinking on how to link executive pay with performance. *Harvard Business Review* (March-April): 91–101.

Reichelstein, S. 1997. Investment decisions and managerial performance evaluation. *Review of Accounting Studies* 2: 157–180.

———. 2000. Providing managerial incentives: Cash flows versus accrual accounting. *Journal of Accounting Research* 38 (2): 243–269.

Rogerson, W. 1997. Inter-temporal cost allocation and managerial investment incentives: A theory explaining the use of Economic Value Added as a performance measure. *Journal of Political Economy* 105 (4): 770–795.

Sliwka, D. 2002. On the use of nonfinancial performance measures in management compensation. *Journal of Economics and Management Strategy* 11 (3): 487–511.

Young, D., and S. O'Byrne. 2000. *EVA and Value-Based Management.* New York, NY: McGraw Hill.

THE ACCOUNTING REVIEW
Vol. 80, No. 4
2005
pp. 1101–1124

Economic Effects of Tightening Accounting Standards to Restrict Earnings Management

Ralf Ewert
Goethe-University Frankfurt

Alfred Wagenhofer
University of Graz

ABSTRACT: This paper examines the usual claim that tighter accounting standards reduce earnings management and provide more relevant information to the capital market. We distinguish between accounting and real earnings management and assume that a standard setter can only influence accounting earnings management by the tightness of standards. In a rational expectations equilibrium model, we find that earnings quality increases with tighter standards, but we identify several consequences that may outweigh this benefit. First, managers increase costly real earnings management because the higher earnings quality increases the marginal benefit of real earnings management. Second, tighter standards can increase rather than decrease expected accounting and total earnings management. Third, the expected total costs of earnings management can also increase. We provide conditions for the occurrence of each of these effects.

Keywords: *accounting standards; earnings management; earnings quality; standard setting.*

I. INTRODUCTION

Accounting standard setters commonly perceive earnings management as undesirable and attempt to reduce management's discretion for earnings management by tightening accounting standards. For example, in late 2003 the International Accounting Standards Board eliminated accounting options in several standards with what it called an "improvements project" (IASB 2003). Other ways to tighten standards are to limit the impact of judgment by managers (and auditors), e.g., by requiring measurement with trustworthy, but perhaps less relevant, numbers and by providing more "bright-line" rules or

---

Helpful comments by the editor, two anonymous reviewers, Sunil Dutta, Ron Dye, Jerry Feltham, Jan-Pieter Krahnen, Barbara Pirchegger, Stefan Reichelstein, Christian Riegler, Stefan Wielenberg, and participants at the Accounting Workshop at the Stuttgart Institute of Management and Technology, Stanford Accounting Summer Camp, EAA Annual Congress in Prague, EIASM Workshop on Accounting and Regulation in Siena, and University of Fribourg are gratefully acknowledged.

Editor's note: This paper was accepted by Madhav Rajan.

Submitted October 2003
Accepted May 2005

detailed guidance. The discussion of principles-based versus rules-based standards is in line with this reasoning.

As noted by several authors, including Schipper (2003), tighter accounting standards may lead to a substitution effect in that the reduction of accounting earnings management is met with increased real earnings management, thereby counteracting the standard-setter's intention. In contrast to accounting earnings management, real earnings management consumes real resources. However, the sources and consequences of such substitution effects are seldom explicated. In this paper, we study the effects of tighter accounting standards in a capital market setting and consider the following questions: Do tighter standards improve earnings quality? Can tighter accounting standards indeed reduce earnings management? How do they affect the cost of earnings management in a capital market equilibrium?

We distinguish between accounting and real earnings management; accounting earnings management includes the way accounting standards are applied to record given transactions and events, whereas real earnings management changes the timing or structuring of real transactions. Real earnings management implies that the manager deviates from an otherwise optimal plan of actions only to affect earnings, thus, imposing a real cost to the firm. We argue that an accounting standard setter can tighten standards to restrict the discretion for accounting earnings management, but can do little to restrict real earnings management.

Our results confirm that tighter accounting standards strictly increase earnings quality, as measured by the variability of reported earnings and the association between reported earnings and the market price reaction (value relevance). We derive insights into the change in the level of earnings management if accounting standards are tightened. We establish that real earnings management strictly increases because the tighter standards induce a greater value relevance, which again increases the marginal benefit of real earnings management. Next, we provide conditions for a decrease, but also conditions for an increase in expected accounting earnings management and expected total earnings management with tighter standards. This latter result obtains if expected accounting earnings management was originally small; in that case, the increase in value relevance increases accounting earnings management. Thus, we provide an endogenous explanation for a substitution of accounting by real earnings management, and we give conditions when it arises and when it does not. Finally, we analyze the effect of tightening accounting standards on the costs of earnings management in equilibrium, which include the manager's disutility and the change in firm value due to earnings management. Tighter standards strictly decrease firm value, but the total costs can either decrease or increase, depending on the changes in accounting and real earnings management induced by the resulting earnings quality change. An increase in expected total costs is more likely the more uncertain is the market about the manager's earnings management objective. These results include several consequences of tighter standards that run counter to conventional wisdom. Therefore, they are relevant for standard setting, which should be aware of these potentially harmful effects in the development of standards, and for the design of empirical tests of earnings management across accounting regimes.

Our paper builds on Fischer and Verrecchia (2000), who analyze rational expectations equilibria with earnings management. We extend their model by distinguishing between accounting and real earnings management and focus on the effects of varying accounting standards. Sankar and Subramanyam (2001) study earnings management in a two-period capital market setting. They use a utility function similar to ours and show that earnings management may allow a manager to communicate value-relevant private information through the earnings report. Thus, earnings management can lead to increased value relevance and is valuable given appropriate restrictions by accounting principles. However, Sankar and Subramanyam (2001) do not explicitly study standard-setting issues.[1]

Demski (2004) sketches a model with substitution between accounting and real earnings management. He assumes that tighter standards reduce accounting earnings management, but lower the disutility of engaging in real earnings management. Tightening standards directly increases real earnings management and the related social cost. While the idea in his paper is related to our paper, we find an endogenous explanation for the occurrence of a substitution effect.

Dye (2002) analyzes earnings management in the form of binary classification manipulations, which are costly to the manager and inferred by the rational capital market participants in a one-period equilibrium model. He is interested in efficient accounting standard setting, taking into account that the equilibrium outcome deviates from the "official" classification standard. Dye and Sridhar (2004) study relevance and reliability of accounting information and model the accountant as the gatekeeper to trade off these two characteristics in a capital market equilibrium.

Earnings management has also been studied in the context of agency models. These models challenge the view that earnings management is undesirable and identify situations in which a principal would want to provide reporting discretion to a manager.[2] A paper that studies optimal standard setting is by Liang (2004), who finds that some discretion for earnings management can improve risk allocation in a two-period agency model. Christensen et al. (2004) consider a general renegotiation setting and assume that the manager can bias reported income at a disutility and that the principal can control the disutility, which is similar to our standard-setter's control variable. The findings of these papers are similar in spirit to our main result that it can be preferable to loosen accounting standards and thereby increase accounting earnings management, although for different reasons.

The rest of the paper is organized as follows: Section II sets out the model and describes the assumptions. Section III derives and characterizes linear reporting equilibria. Section IV contains the main results for tightening accounting standards on earnings quality, the equilibrium earnings management policies, and the total costs of earnings management. Section V discusses some extensions, and Section VI concludes.

II. THE MODEL

We consider two strategic players, a risk-neutral manager of a firm and a competitive, risk-neutral capital market. *A priori*, the terminal value of the firm $\tilde{x}$ is normally distributed with mean $E[\tilde{x}] > 0$ and variance σ_x^2. In order to focus on earnings management decisions, we do not explicitly consider the underlying production decisions by the manager that may affect $\tilde{x}$. In the first period the manager engages in earnings management and reports potentially biased earnings, and the capital market uses the reported earnings to adjust the market price; in the second period the earnings management effect unwinds. The two periods are representative of a multiperiod setting in which the earnings management strategy is independently selected in each period and reverses in one or more subsequent periods.

---

[1] Other papers that study earnings management in rational expectations equilibria are Kirschenheiter and Melumad (2002), Fischer and Stocken (2004), and Stocken and Verrecchia (2004). They do not consider standard setting.

[2] See, e.g., Demski (1998), Dutta and Gigler (2002), and Demski et al. (2004).

The Accounting System

The firm operates an accounting system that records transactions and events according to a set of accounting standards in force, and produces the base information for a periodic financial report. The base information is summarized by a signal $\tilde{y}_t$ in each period. The signals provide unbiased information about the (change in) terminal value $\tilde{x}$, i.e., $\tilde{y}_t = \tilde{x} + \tilde{\varepsilon}_t$, where the noise terms $\tilde{\varepsilon}_t$ are normally distributed with mean 0 and variance σ_t^2 and independent from each other.

At the end of each period t, the manager privately observes the realized earnings signal y_t and is obliged by a regulator to issue a public accounting report m_t about earnings. The report may deviate from the underlying y_t because the manager can engage in earnings management activities described below. The capital market observes m_t and adjusts the market price to $P_t(m_t)$, taking into account the potential bias from y_t.[3]

Earnings Management

We distinguish between two generic types of earnings management activities, accounting and real earnings management, where b_A (b_R) denotes the level of accounting (real) earnings management. After observing y_1, the manager chooses b_A and b_R to inflate or deflate reported earnings m_1 relative to y_1 in the following way:

$$m_1 = y_1 + b_A + b_R. \tag{1}$$

Accounting earnings management includes the interpretation of accounting standards and their application to transactions and events that have already occurred. Essentially, the manager shifts some amount of accounting earnings from one period to the other. We assume that clean surplus holds, so that reported earnings in period two change by $-b_A$.

In contrast, real earnings management affects the timing or structuring of transactions. It occurs if the manager undertakes transactions that are inefficient from the firm's perspective, but generate a desired profit or loss in the current period.[4] Thus, real earnings management imposes costs on the firm and changes firm value and second-period earnings by an amount over and above b_R. We model these costs as a linear function of real earnings management, cb_R, where $c \geq 0$, and assume they are incurred in the second period. The choice of the earnings management activities in period one leads to the following reported earnings by the manager in period two:

$$m_2 = y_2 - b_A - b_R = (x + \varepsilon_2 - cb_R) - b_A - b_R. \tag{2}$$

Engaging in real earnings management changes the original terminal value $\tilde{x}$ to $\tilde{x} - cb_R$, and since $\tilde{y}_2$ is an unbiased signal for the terminal value its value changes similarly.

Manager's Utility

In general, the manager's interest in earnings management is driven by numerous factors. We capture these factors broadly by assuming a utility function of the manager that depends on accounting earnings and market price.[5] The manager's interest in accounting reports may result, for example, from: an explicit accounting-based bonus program, debt covenants tied to accounting numbers, the desire to document a positive performance to convince the market about the manager's capabilities, or upcoming tenure decisions. The interest in the firm's market price may stem from: the manager's intention to sell shares he or she owns, an explicit stock-based incentive contract, reducing the threat of a takeover, internalizing market returns as a measure of managerial performance, the desire to raise new capital, or simply the utility of managing a valuable firm ("empire building"). The manager's two-period utility is:

---

[3] In computing the market price, we do not explicitly consider the manager's variable compensation assuming it is small relative to the market price effects.

[4] In order to be recorded in period 1, the transactions must occur before the end of the period (excluding consideration of transactions initiated later but antedated). If real earnings management depends on y_1 (which is not the case in equilibrium in this model), one would have to assume that the manager can observe y_1 or closely related information already before the reporting date.

$$U = sm_1 + pP_1 + m_2 - v(b_A,b_R), \tag{3}$$

where $s > 0$ denotes the weight attached on the accounting report m_1 relative to m_2; p is the weight on the market price P_1 (or change in the market price); and v is the manager's disutility from engaging in earnings management.

For simplicity, we do not include P_2 into the manager's utility function. What is key for our results is that the manager has some interest in the long-term effects of earnings management in $t = 1$, which we capture through the accounting report m_2 in the manager's two-period utility. We discuss potential effects of an inclusion of P_2 in Section V.

The market does not exactly know the manager's interest in earnings management, but holds beliefs of the factors and their weights in the utility function. We model the market's uncertainty following Fischer and Verrecchia (2000) and assume that the weight $\tilde{p}$ on the market price is a normally distributed random variable with expected value $E[\tilde{p}] = \bar{p} > 0$ and variance σ_p^2; the distribution is independent of that of the terminal value and the signals $\tilde{y}_t$. Although we assume that $\bar{p}$ is strictly positive, the realized p can be negative, for example, if the manager plans to repurchase shares, receives stock options, or engages in a management buyout. The manager observes p before he or she makes the earnings management decision, whereas the capital market only knows the prior distribution of $\tilde{p}$ and prices the firm based on its expectation of the manager's incentives to influence the market price. This uncertainty prevents the market from perfectly inferring the manager's earnings management activities in equilibrium.

The relative weight s on reported earnings is given and common knowledge, e.g., because information about the management compensation package and/or the existing bond covenants is publicly available. In principle, there can also be uncertainty with respect to s; including such additional uncertainty would only increase the complexity of the analysis without yielding additional insights. Time preferences can be easily incorporated by an appropriate choice of s, as can a more short-term or long-term orientation. Implicit in the assumption of the manager's utility is that the underlying incentive problem does not interact with the earnings management decisions.

The disutility v is convex in both accounting and real earnings management:

$$v(b_A,b_R) = \frac{rb_A^2}{2} + \frac{b_R^2}{2}. \tag{4}$$

The parameter r is explained below. The disutility captures, for example, time and effort needed to find and execute the appropriate actions as well as to negotiate with the auditor, psychic costs of biasing accounting earnings, and individual regulatory and litigation risks.[6] We assume that the disutility incurred by the manager is additive in the two types of earnings management. Therefore, there is no direct interaction between them. The convexity captures the fact that it becomes increasingly cumbersome for the manager to find more opportunities for either type of earnings management.

---

[5] Jiambalvo (1996) discusses various incentives for earnings management.

Tightness of Accounting Standards

The parameter r in Equation (4) reflects the effect of tighter accounting standards in our model. We formalize tightening accounting standards by increasing r, where $r \geq 1$.[7] Tighter standards make it more costly for the manager to achieve a desirable level of accounting earnings management.[8]

This formalization captures the notion that, from a standard-setting perspective, a key difference between accounting and real earnings management lies in the fact that it is generally much more difficult to restrict real earnings management than accounting earnings management. Real earnings management is often indistinguishable from other economic transactions undertaken by the firm; it may even generate cash flows and, then, avoid measurement issues completely. For example, the sale of inventory or assets at a bargain price is recognized in income, whatever the motivation for this sale has been. It is easier for a standard setter to tighten accounting standards that reduce management's discretion for accounting earnings management, taking as given the economic transactions and events over the reporting period.

In practice, the distinction between accounting and real earnings management is not always clear. Examples are leases, recognition and derecognition of financial instruments, and variable interest entities, which involve a great deal of structured transactions with economic effects. While we use accounting and real earnings management as a typical distinction, our formalization is open to a more general interpretation. It captures a situation in which there are two sets of earnings management opportunities, and the standard setter considers restricting one set. Our interpretation has the advantage that we can examine the role of real costs incurred by one set of earnings management activities.

Figure 1 summarizes the sequence of events.

III. EQUILIBRIUM

A reporting equilibrium consists of an earnings report and a market price reaction with the following properties. The manager selects b_A and b_R to maximize his or her expected utility given the realized weight p of the market price in the utility function, knowledge of y_1 and real cost c, and the conjecture (indicated by a caret) of the market price reaction on the reported earnings, $\hat{P}_1(m_1)$:

$$b_A^*, b_R^* \in \arg\max_{b_A, b_R} sm_1 + p\hat{P}_1(m_1) + E[m_2] - \frac{rb_A^2}{2} - \frac{b_R^2}{2}. \tag{5}$$

In general, the manager's optimal earnings management activities, $b_A^*(y_1, p)$ and $b_R^*(y_1, p)$, depend on the realized signal y_1 and weight p, which are private information of the

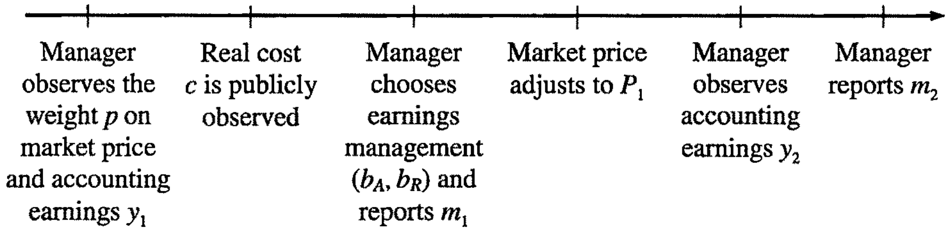
---

[6] See Marquardt and Wiedman (2004) for a description of the cost of different instruments of earnings management.

[7] There are other instruments that increase r besides the tightening of accounting standards. For example, the Sarbanes-Oxley Act of 2002 requires the CEO and CFO to certify the financial statements of the firm, thus, increasing their private risk of litigation.

[8] An alternative, but qualitatively similar, formulation of the effect of tighter standards would be that they reduce the effect of the bias in reported earnings, $m_1 = y_1 + b_A/r + b_R$ with $r \geq 1$.

FIGURE 1
Sequence of Events


Manager observes the weight p on market price and accounting earnings y_1
Real cost c is publicly observed
Manager chooses earnings management (b_A, b_R) and reports m_1
Market price adjusts to P_1
Manager observes accounting earnings y_2
Manager reports m_2

manager. The capital market adjusts the market price of the firm under rational conjectures $\hat{b}_A$ and $\hat{b}_R$ regarding the choice functions of the manager. The price $P_1(m_1|\hat{b}_A, \hat{b}_R)$ equals the expected terminal value of the firm conditional upon the manager's report and the conjectured reporting strategy. In equilibrium, the conjectures must equal the actual functions, i.e., $b_A^*(y_1, p) = \hat{b}_A(y_1, p)$, $b_R^*(y_1, p) = \hat{b}_R(y_1, p)$, and $\hat{P}_1 = P_1$. Our first result establishes that any equilibrium must involve some form of earnings management.

Lemma 1: Every equilibrium with a differentiable and nonconstant price function P_1 involves earnings management by the manager (i.e., $b_A^*, b_R^* \neq 0$ with probability one).

All proofs are in the Appendix.

Lemma 1 rules out equilibria with no earnings management for arbitrary differentiable conjectures about the market price, given the accounting report is not simply ignored by the capital market participants. Further insights into equilibria are obtained by imposing some structure on the form of the conjectures of earnings management and the price reaction. We restrict attention to linear equilibria in which the pricing function $P_1(m_1)$ is linear in m_1:

$$P_1 = \alpha + \beta m_1. \tag{6}$$

The manager uses the conjectures $\hat{\alpha}$ and $\hat{\beta}$ and maximizes his or her expected utility over b_A and b_R:

$$s(y_1 + b_A + b_R) + E[y_2|y_1] - b_A - b_R + p(\hat{\alpha} + \hat{\beta}(y_1 + b_A + b_R)) - \frac{rb_A^2}{2} - \frac{b_R^2}{2}, \tag{7}$$

where y_2 already includes the real cost cb_R of earnings management. The first-order conditions with respect to b_A and b_R yield:

$$\frac{\partial U}{\partial b_A} = s - 1 + p\hat{\beta} - rb_A^* = 0,$$

$$\frac{\partial U}{\partial b_R} = s - 1 - c + p\hat{\beta} - b_R^* = 0.$$

These two equations do not depend on y_1 and, hence, the optimal levels of earnings management activities, b_A^* and b_R^*, are independent of the accounting earnings y_1. Let $\Delta s \equiv s - 1$ be the difference in the (relative) weights in the two periods and $R \equiv (1 + r)/r$. The following proposition establishes existence and the characteristics of linear equilibria.

Proposition 1:

(i) There exists a linear equilibrium in which the manager chooses the accounting and real earnings management policies:

$$\begin{aligned} b_A^* &= (\Delta s + p\beta) \cdot \frac{1}{r} \\ b_R^* &= \Delta s + p\beta - c \end{aligned} \tag{8}$$

and the market price of the firm adjusts linearly in m_1 with strictly positive weight β on the earnings report, where β is implicitly defined by:

$$\beta = \frac{\sigma_x^2 - c\beta^2 R\sigma_p^2}{\sigma_x^2 + \sigma_1^2 + \beta^2 R^2 \sigma_p^2}. \tag{9}$$

(ii) If $c^2\sigma_p^2 \geq 3(\sigma_x^2 + \sigma_1^2)$, there exist up to two additional equilibria with $\beta < 0$.

In equilibrium, the sign of accounting earnings management is determined by the sign of $(\Delta s + p\beta)$. Δs captures the direct compensation effects of shifting reported earnings between the two periods. A positive Δs favors aggressive earnings management because the benefit from early reporting of earnings on compensation in period one is greater than the corresponding cost in period two. The second term, $p\beta$, results from the effect of earnings management on the equilibrium market price.

Real earnings management also depends on $(\Delta s + p\beta)$, but the manager factors in the effect of the real cost c in the second period on his or her expected utility. The cost $c > 0$ curbs an incentive for aggressive real earnings management. Further, $-c$ is the beneficial effect of real decision making per unit of b_R and $(\Delta s + p\beta)$ captures the actual real earnings management, i.e., the bias due to reporting incentives. To see this, suppose there were no earnings management. The (benevolent) manager maximizes the expected terminal value net of (the monetary equivalent of) his or her personal disutility:

$$E[\tilde{x}] - cb_R - \frac{b_R^2}{2}$$

by choosing $b_R^+ = -c$.

The market adjusts the market price with a rate of β of the earnings report m_1. β is based on the revision of the expected terminal value conditional on m_1, $\sigma_x^2/(\sigma_x^2 + \sigma_1^2)$, if there were no earnings management, and additional terms that correct for the expected earnings management. The equilibrium β in Equation (9) is lower than the β that would emerge without earnings management, as the numerator decreases and the denominator increases, *ceteris paribus*. The more uncertain the market is about the manager's propensity for the market price, measured by an increasing σ_p^2, the less is the price reaction on the earnings report. The numerator of Equation (9) includes a term that also depends on the real cost c, which captures the fact that the capital market infers from the reported earnings m_1 information about p and uses it to update its expectations of the change in firm value due to the cost of real earnings management.

The Proposition states that there always exists an equilibrium with strictly positive β, but there may be additional equilibria with strictly negative β if $c^2\sigma_p^2 \geq 3(\sigma_x^2 + \sigma_1^2)$. A negative β implies that the market price decreases in the earnings report. This counterintuitive finding is due to the fact that the earnings report not only informs the market about the terminal value, but also about the incentive weight p. If the market associates a favorable earnings report with large values for p, then it expects large real earnings management and, consequently, a great reduction in firm value. The higher the incentive variance σ_p^2, the more is the earnings report driven by the incentive parameter p, thus making it more likely that the condition $c^2\sigma_p^2 \geq 3(\sigma_x^2 + \sigma_1^2)$ is fulfilled. In what follows, we confine attention to the equilibrium with a positive β and assume $c^2\sigma_p^2 < 3(\sigma_x^2 + \sigma_1^2)$.

IV. EFFECTS OF TIGHTER ACCOUNTING STANDARDS

In this section, we examine the effects of tighter standards (i.e., increasing r) on the quality of reported earnings, the level of earnings management, and the total cost of earnings management. The subsequent results analogously apply for loosening standards.

Standard setters are interested in the average effects of a policy change. Similarly, the empirical literature focuses on average earnings management. Therefore, much of the following analysis is in terms of expected earnings management, that is, we state the effects from an *ex ante* perspective with respect to the sensitivity p of the manager's utility on market price.

Quality of Reported Earnings

Earnings quality has generated considerable interest in the empirical literature. For example, Francis et al. (2004) discuss seven attributes of (reported) earnings. In this model, we examine two earnings quality attributes, value relevance and earnings variability.[9] Value relevance is typically measured by the association between reported earnings and the change in market prices, i.e., β in our model. Earnings variability (or efficiency) is often measured by the standard deviation or the variance of earnings. Proposition 2 provides the results.

Proposition 2: Tighter accounting standards imply a higher value relevance β and a lower variance $\mathrm{var}(\tilde{m}_1)$ of reported earnings.

Proposition 2 confirms that tighter standards reduce the noise in reported earnings and make them more value-relevant and less variable in equilibrium.[10] Assuming the objective of a standard setter is to improve the quality of reported earnings, tightening accounting standards unambiguously achieves this objective. While Proposition 2 is intuitive, it is not straightforward because of the interaction between the changing incentives for earnings management and the quality of earnings. The following discussion examines these effects in more detail.

---

[9] Fischer and Stocken (2004) use the expected value of the square of the difference between unbiased and managed earnings as a measure of earnings quality.

[10] Fischer and Verrecchia (2000) obtain a similar result in their model without real earnings management.

Level of Earnings Management

An increase of r has a direct effect on accounting earnings management; it becomes more costly in terms of the disutility for the manager to achieve a certain level of earnings management. Tightening standards has no direct effect on real earnings management. However, there is another effect on accounting and real earnings management, which stems from the change in earnings quality. We consider these effects for a manager, who is expected to have an incentive for aggressive earnings management, i.e., $\Delta s + \bar{p}\beta > 0$.[11] In this case, expected accounting earnings management is strictly positive, as is expected real earnings management if it is measured against the benchmark of $b_R^+ = -c$.

Proposition 3: Tighter accounting standards imply:

(i) Expected real earnings management strictly increases.

(ii) If $\Delta s \geq 0$, then expected accounting earnings management and expected total earnings management strictly decrease.

(iii) For any $\Delta s < 0$ there exist $\delta_1, \delta_2 > 0$ such that for $\delta_1 < \bar{p} < \delta_2$ expected accounting earnings management and expected total earnings management strictly increase.

Part (i) establishes that expected real earnings management strictly increases for tighter accounting standards. The increase in the value relevance β (Proposition 2) increases the marginal benefit of real earnings management and, in turn, the manager engages in more real earnings management in equilibrium.

Part (ii) confirms an intuitive result if $\Delta s \geq 0$: Tightening standards strictly decreases expected accounting earnings management because it increases the manager's disutility from accounting earnings management and lowers his or her incentive to engage in such activities. However, the increase in value relevance runs counter to this effect and increases the benefit from accounting earnings management. It turns out that, in equilibrium, the direct (disutility) effect dominates the effect from the increased value relevance. Parts (i) and (ii) together establish that there is an endogenous substitution between accounting and real earnings management that arises from the market reaction alone; there are no direct interdependencies between the two types of earnings management. Moreover, the increase in real earnings management only partially substitutes for the reduction in accounting earnings management because, in equilibrium, expected total earnings management strictly decreases in r.

Part (iii) of the Proposition shows that these intuitive results need not hold any more if $\Delta s < 0$, and it records conditions for which expected accounting earnings management strictly increases. Since real earnings management always increases, expected total earnings management increases, as well, and the substitution effect vanishes. This result obtains if the benefit from accounting earnings management due to the increased value relevance exceeds the increase in disutility. This is more likely to occur for lower expected accounting earnings management, which eventually leads to the necessary condition $\Delta s < 0$.

The proof is constructive and gives explicit expressions for the lower and upper bounds on $\bar{p}$ such that expected earnings management increases for arbitrarily chosen $\Delta s < 0$. The lower bound δ_1 is determined by the situation in which the manager's expected earnings management incentives just cancel, i.e., $\Delta s + \delta_1\beta(r) = 0$. While the value relevance

---

[11] A similar analysis can be performed for conservative earnings management. The focus on aggressive earnings management is meant to better describe current practice on average and to avoid too many case distinctions in the presentation of the results.

$\beta > 0$ is endogenous (and clearly depends on r), it does not depend on Δs and $\bar{p}$. Fixing an arbitrary $r \geq 1$ as a starting point for tightening standards, β is fully determined by exogenous variables. In this case, expected accounting earnings management is zero, since taking expectations in Equation (8) for $\bar{p} = \delta_1$ and rearranging yields:

$$rE[b_A^*] = \Delta s + \bar{p}\beta(r) = \Delta s + \delta_1\beta(r). \tag{10}$$

The right-hand side of Equation (10) captures the average marginal benefit of increasing b_A (which equals 0 at $\bar{p} = \delta_1$), and the left-hand side includes the average marginal disutility.[12] At $\bar{p} = \delta_1$, tightening accounting standards has a second-order effect on the manager's average marginal disutility but a positive first-order effect on the average marginal benefit because of the increase in value relevance. Consequently, the equilibrium with tighter standards induces a higher level of expected accounting earnings management. Due to continuity, there is a set of values for $\bar{p}$ with an upper bound δ_2 for which this result still holds while at the same time preserving the (assumed) incentives for aggressive accounting earnings management on average, i.e., $\Delta s + \bar{p}\beta > 0$.

Although the result is theoretically appealing, its empirical relevance is perhaps less significant because it arises only in situations in which earnings management incentives, on average, are not pronounced and, consequently, average earnings management is small. Empirical studies usually try to single out observations in which strong earnings management incentives are hypothesized. Then tighter standards would appear to result in less earnings management.

Given the possibility of an increase in expected earnings management for tighter standards, it is worth revisiting the result in Proposition 2 that the quality of reported earnings increases in r for any Δs, $\bar{p}$, and variance levels. The key driver of this result is not the level of expected earnings management (which is influenced by Δs and $\bar{p}$) but the decrease in the variance of earnings management. Expected total earnings management is:

$$E[b_A^* + b_R^*] = E[\Delta sR + \tilde{p}\beta R - c]$$

and the variance is:

$$\mathrm{var}(b_A^* + b_R^*) = \beta^2R^2\sigma_p^2,$$

which strictly decreases for tighter accounting standards. Thus, earnings quality improves due to the reduction of the noise in reported earnings. Given rational expectations of the market, a shift in the level of earnings management can eventually be backed out in equilibrium by simply adjusting the pricing constant; thus, it has no impact on the sensitivity of the price with respect to earnings.

Costs of Earnings Management

The next analysis examines the effect of tighter standards on the expected costs of earnings management. To motivate the cost analysis, notice that the reporting equilibrium leads to a kind of second-best situation compared to a situation without earnings management. Suppose the manager could credibly precommit to avoid earnings management, and the capital market would believe that. Without earnings management the quality of the financial report would attain its maximum in this setting, $\beta = \sigma_x^2/(\sigma_x^2 + \sigma_1^2)$. Moreover, the manager would not incur disutility of accounting earnings management. The real activities would be chosen to maximize firm value net of the disutility, i.e., $b_R^+ = -c$, which is essentially a first-best adaptation of firm value to the current market conditions, represented by c. The net increase in firm value then is:

---

[12] The same argument holds for the earnings management component of b_R^*.

$$-cb_R^+ - \frac{(b_R^+)^2}{2} = c^2 - \frac{c^2}{2} = \frac{c^2}{2}.$$

However, the manager is unable to credibly precommit to such a behavior. A standard setter cannot substitute for a commitment because tightening accounting standards can only reduce accounting earnings management but not real earnings management. This discussion suggests the change in the costs of earnings management to the parties in equilibrium as a measure of the economic effects of tightening standards.

We define the expected total costs due to earnings management as the sum of (the monetary equivalent of) the expected manager's disutility and the expected real cost of real earnings management:

$$E[TC] = E[v(b_A^*, b_R^*)] + E[cb_R^*] + \frac{c^2}{2}. \tag{11}$$

The first term is the expected disutility, and the second and the third terms capture the real cost. The third term, $c^2/2$, corrects the cost for the beneficial effect of the manager's adjustment ($b_R^+ = -c$). Since this term is constant, it does not affect the following results. Although it is generally difficult to combine different person's utilities, we add the monetary equivalent of the manager's utility and the change in firm value because, in the end, both are costs to the firm (directly or by compensating the manager).

The next proposition provides conditions under which the expected total costs can either decrease or increase.

Proposition 4: Tighter accounting standards imply:
(i) If $c > 0$, then the value of the firm strictly decreases.
(ii) If either σ_x^2 or σ_1^2 is sufficiently large, then the expected total costs decrease.
(iii) If σ_p^2 is sufficiently large relative to $(\sigma_x^2 + \sigma_1^2)$, then for any $\bar{p} > 0$ there exist $\delta_1 < 0$ and $\delta_2 > 0$ such that for $\delta_1 \leq \Delta s \leq \delta_2$ the expected total costs increase. If $\Delta s \geq 0$, then a sufficiently large σ_p^2 relative to $(\sigma_x^2 + \sigma_1^2)$ is also necessary for expected total costs to increase.

The value of the firm directly depends on the level of expected real earnings management because of the cost c associated with it. Since expected real earnings management increases for tighter accounting standards (as shown in Proposition 3 (i)), firm value strictly decreases.

Proposition 4 (ii) states sufficient conditions for a strict decrease in the expected total costs. They require either a highly uncertain terminal value or a highly noisy accounting system. A high variance σ_x^2 relative to the accounting risk σ_1^2 implies that the accounting report is very informative and leads to a value relevance that approaches $\beta = 1$. Then, tightening accounting standards does not materially affect the value relevance and, hence, the substitution effect is negligible. As a consequence, tightening standards reduces the expected total costs. A similar line of argument applies for high accounting risk σ_1^2 relative to σ_x^2: Although a high σ_1^2 reduces the value relevance, it also reduces the marginal value relevance of tighter standards to a value close to zero. Again, the value relevance does not change much due to tighter standards and expected total costs decrease.

Proposition 4 (iii) gives necessary and sufficient conditions for an increase in expected total costs even though expected earnings management reduces. The critical parameter here is the market's uncertainty σ_p^2 about the weight p for the market price effect in the manager's utility function. The Proposition states that for sufficiently high σ_p^2 there always exists a non-empty set of parameters, which leads to an increase in the expected total costs. The reason is that the marginal value relevance $d\beta/dr$ is relatively high, which induces a strong increase in real earnings management and, therefore, leads to an increase in the expected total costs of earnings management.[13]

V. DISCUSSION AND EXTENSIONS

Our analysis of the effects of tightening accounting standards assumes no exogenous interaction between accounting and real earnings management. Our result that real earnings management increases with tighter accounting standards is a subtle consequence of higher value relevance of reported earnings, which increases the marginal benefit of earnings management. A substitution of accounting earnings management by real earnings management arises endogenously (or does not arise under certain conditions). It is, of course, possible to model a direct interaction between accounting and real earnings management. One assumption would be that the manager wants to meet or beat a target, such as an earnings forecast. For simplicity, assume the manager uses earnings management to achieve a target earnings level $\hat{m}_1$ given some signal y_1. Increasing the disutility (decreasing the effectiveness) of accounting earnings management by tightening standards changes the optimal mix of accounting and real earnings management and leads to a substitution effect. Another assumption would be that the manager's marginal disutility of engaging in earnings management depends on the level of both earnings management activities. An example is a disutility of $v(b_A, b_R) = rb_A^2 + 2kb_Ab_R + b_R^2$ with $k \in (0, 1)$. $k \rightarrow 0$ approaches the disutility we use in our model, whereas $k \rightarrow 1$ treats accounting and real earnings management activities equally (an interpretation could be that the manager incurs disutility from the time devoted to the search and implementation of earnings management of either type).

There is empirical evidence of a substitution effect. For example, Barton (2001) finds that financial derivatives are used as a substitute for accounting earnings management. Black et al. (1998) compare the use of asset sales in countries that differ with respect to the option of revaluing noncurrent assets. While upward asset revaluations are not allowed in the United States, they are an available option in the United Kingdom, Australia, and New Zealand. They find that the use of asset sales to smooth income is less pronounced in countries that allow revaluations. It is not clear from these papers what the source of the substitution effect is.

We show in Proposition 4 (i) that tighter accounting standards strictly reduce firm value if $c > 0$. However, we note that our model abstracts from other effects that may affect firm value. For example, the decrease in the variability of reported earnings may benefit investors if they use earnings to provide incentives to risk-averse managers. Moreover, the model assumes risk-neutral valuation in the capital market and does not include the effects of higher value relevance for portfolio decisions of risk-averse investors and risk premiums.

---

[13] Fischer and Verrecchia (2000) derive a related result in their model without real earnings management. They show that for sufficient uncertainty about the manager's incentives his or her utility can increase if earnings management is available. We consider only costs of earnings management and, therefore, our result is driven by the substitution effect.

While the focus of our analysis is on the effects of tighter accounting standards, there are other regulatory actions that can be studied in our framework. One aspect is the quality of the accounting system, represented by the noise σ_1^2 it generates. To produce better information about a firm's financial position, a standard setter might seek to develop standards that reduce such noise. Since β monotonously decreases in σ_1^2, the relevance of the accounting reports indeed increases for lower σ_1^2. However, Proposition 1 also reveals that an increase in β increases earnings management in equilibrium, so reducing σ_1^2 leads to increased expected accounting and real earnings management. Hence, a better accounting system imposes a cost in terms of a change in management behavior. In addition, lower noise σ_1^2 may affect total expected costs if standards are tightened subsequently, since it becomes more probable that the case of Proposition 4 (iii) obtains.

Another aspect concerns the market's uncertainty about the manager's incentive structure. Suppose a standard setter increases the disclosure requirements regarding the components of managers' compensation packages. *Ex ante*, such information reduces the uncertainty over p by lowering σ_p^2. A lower incentive risk reduces the variability of the earnings report, and if the expected value $\bar{p}$ remains unaffected, it implies higher value relevance β and increases earnings quality. However, this comes at a cost because a higher β increases expected accounting and real earnings management and induces a reduction in firm value. Again, the behavior of total expected costs by subsequently tightened standards may change, but now in the opposite direction compared to a reduction of σ_1^2.

We defined the manager's utility function (3) in terms of the accounting reports, m_1 and m_2, and the price P_1, but not P_2. Inclusion of P_2 can have different effects depending on the manager's and the capital market's information endowments. For example, if the utility function depends on P_2 but not on m_2 the results are qualitatively unchanged as m_2 and P_2 are linearly dependent in the linear equilibrium. An alternative specification may be that $\tilde{p}$ is the relative weight of P_1 and P_2 (as is s for accounting earnings), so that:

$$U = sm_1 + pP_1 + m_2 + P_2 - v(b_A, b_R).$$

With linear conjectures, $P_2 = \hat{\alpha}_2 + \hat{\beta}_2 m_1 + \hat{\gamma}_2 m_2$. Then, similar to the situation without P_2, the uncertainty regarding $\tilde{p}$ affects only the utility and pricing terms in $t = 1$ and the optimal policies for the manager are analogous to, but more cumbersome than, those described in Equation (8), which leaves most of our results qualitatively intact. Alternatively, if $\tilde{p}$ also affects the second-period utility:

$$U = sm_1 + pP_1 + m_2 + pP_2 - v(b_A, b_R),$$

then the market learns about $\tilde{p}$ from both periods' reported earnings, which is anticipated by the manager in his or her earnings management decision. Another possible specification would be to assume a second-period weight $\tilde{p}_2$ on P_2, which is known by the manager only at the beginning of the second period. Such assumptions would lead to more involved solutions than those shown above and make it more difficult to derive the effects of tighter standards.

VI. CONCLUSIONS

This paper contributes to understanding the implications of tightening accounting standards on the quality of information in the capital market, the level of expected accounting and real earnings management, and the expected cost of earnings management. It provides a number of results that challenge conventional wisdom. Tighter accounting standards increase earnings quality, measured by the variability of reported earnings and by the association between reported earnings and market price reactions. Because of that, the marginal benefit of earnings management increases and managers increase real earnings management, which is costly and directly reduces firm value. While tighter standards make accounting earnings management less effective, they do not always reduce earnings management in equilibrium. Indeed, we state conditions under which expected accounting and total earnings management increase for tighter standards. Moreover, the expected total costs of earnings management (the real costs and the manager's disutility of engaging in earnings management) can increase even if expected earnings management reduces. Therefore, the intervention of a standard setter is not unconditionally preferred, even though earnings management incurs a dead-weight loss. Standard setters should consider these potentially unintended consequences in the development of standards and empirical researchers might wish to control for the potentially ambiguous relationships.

While these results suggest a link between accounting and real earnings management activities caused by the change in the earnings quality, most empirical studies consider either accounting or real earnings management. Ignoring real earnings management may have an effect on the estimation of (accounting) earnings management, because most discretionary accruals models use variables whose values may be affected by real earnings management. Further, studies that ignore real earnings management may overestimate the impact of various institutional safeguards to control earnings management. However, capturing the level of real earnings management empirically is difficult because it is often indistinguishable from normal activities. One possibility might be to measure the potential for accounting earnings management, e.g., by a proxy for the overstatement of net assets in the balance sheet (Barton and Simko 2002), and infer the incentives for real earnings management.

The results of the analysis rely on several assumptions. One assumption is that the basic firm value and the manager's objective function are given exogenously. In a more comprehensive model, the manager's productive decisions, incentives for effort, and earnings management activities could be integrated. Such a setting may provide insights into interactions of earnings management and the design of managerial compensation. However, our analysis is an important first step in such a more general setting: finding an optimal contract requires anticipation of the contingent effects contracts have in the second stage.

Recent research casts doubt on the descriptive validity of the assumption that the investors fully understand the reporting situation and are able to infer the equilibrium earnings management policies. For example, investors may be inattentive and naively take the reported earnings at face value (functional fixation).[14] Different representations of investor behavior may affect the equilibrium strategies and the resulting costs and benefits of earnings management. Finally, the model structure could be used to address other forms of accounting regulation, such as changes in the precision of accounting information (for which we present some preliminary analysis) or the inclusion of supplemental disclosures if accounting standards are tightened. Our focus on the interaction between accounting and real earnings management should be viewed as one element of such analyses.

---

[14] See, e.g., Hirshleifer et al. (2002) and Kirschenheiter and Melumad (2002).

APPENDIX

Proof of Lemma 1

Assume an arbitrary differentiable pricing function, $\hat{P}_1(m_1)$. The manager maximizes

$$b_A^*, b_R^* \in \arg\max_{b_A, b_R} s(y_1 + b_A + b_R) + p\hat{P}_1(m_1) + E[y_2|y_1] - b_A - b_R - \frac{rb_A^2}{2} - \frac{b_R^2}{2}.$$

The necessary first-order conditions for a maximum are:

$$\frac{\partial U}{\partial b_A} = s - 1 + p\frac{d\hat{P}}{dm_1} \cdot \frac{\partial m_1}{\partial b_A} - rb_A^* = 0$$

$$\frac{\partial U}{\partial b_R} = s - 1 - c + p\frac{d\hat{P}}{dm_1} \cdot \frac{\partial m_1}{\partial b_R} - b_R^* = 0$$

where $\frac{\partial m_1}{\partial b_i^*} = 1$ for $i = A, R$. An equilibrium with $b_A^* = 0$ and $b_R^* = 0$ requires:

$$\frac{d\hat{P}}{dm_1} = \frac{1 - s}{p} = \frac{1 + c - s}{p}.$$

This condition can only hold for $c = 0$. If $s \neq 1$, the value of the derivative is completely determined by the random variable p, so the equation can hold only by coincidence. Alternatively, assume $c = 0$ and $s = 1$, then $d\hat{P}/dm_1 = 0$ and the price function must be constant in m_1, which contradicts the assumption of the Lemma. ■

Proof of Proposition 1

Part (i): The optimal earnings management policies in (8) are linear in p:

$$b_A^* = \delta_A + \lambda p \left(\delta_A = \frac{\Delta s}{r}; \lambda = \frac{\hat{\beta}}{r}\right)$$

$$b_R^* = \delta_R + \phi p \ (\delta_R = \Delta s - c; \phi = \hat{\beta}).$$

Then, for any y_1 the earnings report m_1 is also linear in p:

$$m_1 = y_1 + b_A^* + b_R^* = y_1 + \delta_A + \delta_R + (\lambda + \phi)p.$$

Investors revise the market price P_1 using the conjectures of the earnings management activities $\hat{b}_A = \hat{\delta}_A + \hat{\lambda}p$ and $\hat{b}_R = \hat{\delta}_R + \hat{\phi}p$. The market price $P_1(m_1)$ is the expected gross terminal value less the expected real cost of earnings management, i.e.:

$$P_1(m_1) = E[\tilde{x}|m_1] - E[c\hat{b}_R|m_1],$$

where:

$$
\begin{aligned}
E[\tilde{x}|m_1] &= \bar{x} + \frac{\operatorname{cov}(\tilde{x}, \tilde{m}_1)}{\operatorname{var}(\tilde{m}_1)} \cdot (m_1 - \bar{x} - \hat{\delta}_A - \hat{\delta}_B - \bar{p} \cdot (\hat{\lambda} + \hat{\phi})) \\
&= \bar{x} + \frac{\sigma_x^2}{\sigma_x^2 + \sigma_1^2 + (\hat{\lambda} + \hat{\phi})^2 \cdot \sigma_p^2} \cdot (m_1 - \bar{x} - \hat{\delta}_A - \hat{\delta}_B - \bar{p} \cdot (\hat{\lambda} + \hat{\phi}))
\end{aligned}
$$

and:

$$
E[c\hat{b}_R|m_1] = c \cdot (\hat{\delta}_R + \hat{\phi} \cdot E[\tilde{p}|m_1]).
$$

The revised expectation of $\tilde{p}$ is:

$$
\begin{aligned}
E[\tilde{p}|m_1] &= \bar{p} + \frac{\operatorname{cov}(\tilde{p}, \tilde{m}_1)}{\operatorname{var}(\tilde{m}_1)} \cdot (m_1 - \bar{x} - \hat{\delta}_A - \hat{\delta}_B - \bar{p} \cdot (\hat{\lambda} + \hat{\phi})) \\
&= \bar{p} + \frac{(\hat{\lambda} + \hat{\phi}) \cdot \sigma_p^2}{\sigma_x^2 + \sigma_1^2 + (\hat{\lambda} + \hat{\phi})^2 \cdot \sigma_p^2} \cdot (m_1 - \bar{x} - \hat{\delta}_A - \hat{\delta}_B - \bar{p} \cdot (\hat{\lambda} + \hat{\phi})).
\end{aligned}
$$

Combining these equations shows that $P_1(m_1)$ is indeed linear in m_1, i.e., $P_1(m_1) = \alpha + \beta m_1$, with:

$$
\beta = \frac{\sigma_x^2 - c\hat{\phi}(\hat{\lambda} + \hat{\phi})\sigma_p^2}{\sigma_x^2 + \sigma_1^2 + (\hat{\lambda} + \hat{\phi})^2\, \sigma_p^2} \tag{A1}
$$

$$
\alpha = \bar{x} - c(\hat{\delta}_R + \hat{\phi}\bar{p}) - \beta(\bar{x} + \hat{\delta}_A + \hat{\delta}_R + (\hat{\lambda} + \hat{\phi})\bar{p}). \tag{A2}
$$

In equilibrium, the conjectures of the market and of the manager must be met, i.e.:

$$
\delta_A = \hat{\delta}_A,\ \delta_R = \hat{\delta}_R,\ \lambda = \hat{\lambda},\ \phi = \hat{\phi}
$$

$$
\alpha = \hat{\alpha},\ \beta = \hat{\beta}.
$$

The terms in (A1) and (A2) solely depend on parameters that are common knowledge. What remains to be shown is the existence of values that satisfy these equations.

First, the manager's policy must maximize his or her expected utility. The first-order conditions are derived in the text. The second-order conditions are:

$$
\frac{\partial^2 U}{\partial b_A^2} = \frac{\partial}{\partial b_A}(\Delta s + p\beta - rb_A^*) = -r < 0
$$

$$
\frac{\partial^2 U}{\partial b_R^2} = \frac{\partial}{\partial b_R}(\Delta s - c + p\beta - b_R^*) = -1 < 0
$$

$$
\frac{\partial^2 U}{\partial b_A^2}\frac{\partial^2 U}{\partial b_R^2} - \left(\frac{\partial^2 U}{\partial b_A \partial b_R}\right)^2 = r > 0
$$

because the cross-derivative is $\frac{\partial^2 U}{\partial b_A \partial b_R} = 0$. Therefore, the earnings management activities constitute a maximum (since $r \geq 1$) and they are unique for a given β.

Second, β as defined (A1) in must be a solution. Substituting $\hat{\lambda} = \lambda = \frac{\beta}{r}$, $\hat{\phi} = \phi = \beta$ and $R \equiv (1 + r)/r$, β is implicitly defined by:

$$Z(\beta) \equiv \beta^3 R^2 \sigma_p^2 + \beta^2 cR\sigma_p^2 + \beta(\sigma_x^2 + \sigma_1^2) - \sigma_x^2 = 0.$$

A third-degree polynomial has up to three real roots. Since $c \geq 0$, Descartes' rule of signs implies that $Z(\beta) = 0$ has exactly one positive real solution. This β lies between 0 and $\sigma_x^2/(\sigma_x^2 + \sigma_1^2) < 1$ because $Z = -\sigma_x^2 < 0$ for $\beta = 0$; $Z > 0$ for $\beta = \sigma_x^2/(\sigma_x^2 + \sigma_1^2) < 1$; moreover, $Z(\beta)$ strictly increases for $\beta > 0$.

Part (ii): The other two solutions to $Z(\beta) = 0$—should they exist in real numbers—are necessarily negative. Since $Z(0) = -\sigma_x^2 < 0$, such roots do not exist if $Z(\beta)$ increases monotonically in β for the entire real line. Since $Z(\beta) \to -\infty$ if $\beta \to -\infty$, a necessary and sufficient condition for the existence of negative real roots of $Z(\beta) = 0$ is that $Z(\beta)$ attains a maximum for some $\beta_m < 0$ such that $Z(\beta_m) \geq 0$. A necessary condition for a maximum is given by the first-order condition:

$$\frac{dZ(\beta_m)}{d\beta} = 3\beta_m^2\left(\frac{1 + r}{r}\right)^2 \sigma_p^2 + 2\beta_m c\left(\frac{1 + r}{r}\right)\sigma_p^2 + (\sigma_x^2 + \sigma_1^2) = 0.$$

This quadratic equation has two real roots if the following condition holds:

$$4c^2\left(\frac{1 + r}{r}\right)^2 (\sigma_p^2)^2 - 12\left(\frac{1 + r}{r}\right)^2 \sigma_p^2(\sigma_x^2 + \sigma_1^2) \geq 0$$

which is equivalent to:

$$\frac{1}{3} c^2\sigma_p^2 \geq \sigma_x^2 + \sigma_1^2.$$

If this inequality holds, $Z(\beta) = 0$ has two local extremes, $\beta_{m2} < \beta_{m1} < 0$, where β_{m1} is a local minimum and β_{m2} constitutes a local maximum. If $Z(\beta_{m2}) = 0$ then β_{m2} is the only negative real root for $Z(\beta) = 0$. If $Z(\beta_{m2}) > 0$, then there exist two negative real roots for $Z(\beta) = 0$. ■

Proof of Proposition 2

β is implicitly defined in $\beta^3R^2\sigma_p^2 + \beta^2 cR\sigma_p^2 + \beta(\sigma_x^2 + \sigma_1^2) - \sigma_x^2 = 0$. The total derivative is:

$$\frac{d\beta}{dr} = \frac{2\beta^3 R\sigma_p^2 + \beta^2 c\sigma_p^2}{r^2(3\beta^2R^2\sigma_p^2 + 2\beta cR\sigma_p^2 + \sigma_x^2 + \sigma_1^2)} > 0$$

for $\beta > 0$ and using the fact that $\frac{dR}{dr} = -\frac{1}{r^2} < 0$.

The variance of the earnings report m_1 is $\mathrm{var}(\tilde{m}_1) = \sigma_x^2 + \sigma_1^2 + \beta^2R^2\sigma_p^2$. Assume to the contrary that the variance does not decrease for greater r. Fix two values with $r_2 > r_1$. Then, $\beta_2 > \beta_1$ and $R_2 < R_1$. A non-decreasing variance implies:

$$(\beta_2R_2)^2 \geq (\beta_1R_1)^2 \Leftrightarrow \beta_2R_2 \geq \beta_1R_1.$$

Since $\beta_2 > \beta_1$, it follows that $\beta_2^2R_2 > \beta_1^2R_1$. But then:

$$\frac{\sigma_x^2 - c\beta_2^2R_2\sigma_p^2}{\sigma_x^2 + \sigma_1^2 + \beta_2^2R_2^2\sigma_p^2} = \beta_2 < \frac{\sigma_x^2 - c\beta_1^2R_1\sigma_p^2}{\sigma_x^2 + \sigma_1^2 + \beta_1^2R_1^2\sigma_p^2} = \beta_1$$

which is a contradiction. Hence, $\mathrm{var}(\tilde{m}_1) = \sigma_x^2 + \sigma_1^2 + \beta^2R^2\sigma_p^2$ decreases in r. ■

Proof of Proposition 3

Part (i): Expected real earnings management is $E[b_R^*] = \Delta s - c + \bar{p}\beta$. The total derivative is:

$$\frac{dE[b_R^*]}{dr} = \bar{p} \cdot \frac{d\beta}{dr} > 0.$$

Part (ii): Expected total earnings management is $E[b^*] = -c + (\Delta s + \bar{p}\beta) \cdot R$. The total derivative is:

$$\begin{aligned}\frac{dE[b^*]}{dr} &= (\Delta s + \bar{p}\beta) \cdot \frac{dR}{dr} + \bar{p}R \cdot \frac{d\beta}{dr}\\ &= \frac{dR}{dr} \cdot \left((\Delta s + \bar{p}\beta) - \bar{p} \cdot \frac{2\beta^3R^2\sigma_p^2 + \beta^2cR\sigma_p^2}{3\beta^2R^2\sigma_p^2 + 2\beta cR\sigma_p^2 + \sigma_x^2 + \sigma_1^2}\right)\\ &= \frac{dR}{dr} \cdot \left[\Delta s + \bar{p}\beta \cdot \left(1 - \frac{2\beta^2R^2\sigma_p^2 + \beta cR\sigma_p^2}{3\beta^2R^2\sigma_p^2 + 2\beta cR\sigma_p^2 + \sigma_x^2 + \sigma_1^2}\right)\right] < 0\end{aligned}$$

for $\Delta s \geq 0$ and $\beta > 0$. Finally, $E[b^*] = E[b_A^*] + E[b_R^*]$, $\frac{dE[b_R^*]}{dr} > 0$, and $\frac{dE[b^*]}{dr} < 0$ establish $\frac{dE[b_A^*]}{dr} < 0$.

Part (iii): Expected accounting earnings management is:

$$E[b_A^*] = (\Delta s + \bar{p}\beta) \cdot \frac{1}{r}$$

and the total derivative with respect to r is:

$$\frac{dE[b_A^*]}{dr} = \frac{1}{r} \cdot \left[-\frac{\Delta s + \bar{p}\beta}{r} + \underbrace{\bar{p} \cdot \frac{d\beta}{dr}}_{>0}\right]. \tag{A3}$$

Note that for any $r \geq 1$, the values for β and $d\beta/dr$ are completely determined by exogenous variables and are independent of $\bar{p}$ and of Δs. Further, $\bar{p}$ and Δs are independent of each other. Let $\Delta s < 0$, fix an $r \geq 1$ and choose $\bar{p}$ equal to:

$$\delta_1 = -\frac{\Delta s}{\beta} > 0.$$

Inserting δ_1 gives:

$$\frac{dE[b_A^* | \bar{p} = \delta_1]}{dr} = \frac{1}{r} \cdot \left[-\frac{(\Delta s + \delta_1 \beta)}{r} + \delta_1 \cdot \frac{d\beta}{dr} \right] = \frac{1}{r} \cdot \delta_1 \cdot \frac{d\beta}{dr} > 0$$

and, because of continuity, the derivative remains positive for an interval around δ_1. In particular, for any $r \geq 1$ and $\Delta s < 0$ there are values for $\bar{p}$ such that $\Delta s + \bar{p}\beta > 0$ is "small" and the derivative is still strictly positive until $\bar{p}$ approaches an upper bound of:

$$\bar{p} < \delta_2 = -\frac{\Delta s}{\beta - r \cdot \dfrac{d\beta}{dr}}.$$

$\delta_2 > \delta_1$ follows from:

$$\begin{aligned} 0 < r \cdot \frac{d\beta}{dr} &= r \cdot \frac{2\beta^3 R\sigma_p^2 + \beta^2 c\sigma_p^2}{r^2(3\beta^2 R^2 \sigma_p^2 + 2\beta c R\sigma_p^2 + \sigma_x^2 + \sigma_1^2)} \\ &= \beta \cdot \frac{2\beta^2 R\sigma_p^2 + \beta c\sigma_p^2}{r(3\beta^2 R^2 \sigma_p^2 + 2\beta c R\sigma_p^2 + \sigma_x^2 + \sigma_1^2)} < \beta \end{aligned}$$

for all $r \geq 1$ and, hence, $R > 1$.

As shown in Part (i), expected real earnings management always increases in r. Therefore, if expected accounting earnings management increases in r, so does expected total earnings management. ■

Proof of Proposition 4

Part (i): The expected terminal value is:

$$E[\tilde{x}] - cE[b_R^*] = E[\tilde{x}] - c \cdot (\Delta s + \bar{p}\beta - c) = E[\tilde{x}] + c^2 - c \cdot (\Delta s + \bar{p}\beta),$$

which is strictly decreasing in r because β strictly increases in r (Proposition 2).

Part (ii): Expected total costs of earnings management as defined in (11) are:

$$\begin{aligned} E[TC] &= E[v(b_A^*, b_R^*) + cb_R^*] + \frac{c^2}{2} \\ &= \frac{rE[(b_A^*)^2]}{2} + \frac{E[(b_R^*)^2]}{2} + cE[b_R^*] + \frac{c^2}{2} \end{aligned}$$

where:

$$\frac{rE[(b_A^*)^2]}{2} = \frac{r}{2}\left(E[b_A^*]^2 + \mathrm{var}(b_A^*)\right) = \frac{(\Delta s + \bar{p}\beta)^2 + \beta^2\sigma_p^2}{2r}$$

$$\frac{E[(b_R^*)^2]}{2} = \frac{1}{2}\left(E[b_R^*]^2 + \mathrm{var}(b_R^*)\right) = \frac{(\Delta s + \bar{p}\beta - c)^2 + \beta^2\sigma_p^2}{2}$$

$$cE[b_R^*] = c(\Delta s + \bar{p}\beta - c).$$

Collecting terms and simplifying, the expected total costs are:

$$E[TC] = \frac{R}{2}\cdot\left((\Delta s + \bar{p}\beta)^2 + \beta^2\sigma_p^2\right).$$

Differentiating totally with respect to r results in:

$$\frac{dE[TC]}{dr} = \frac{d\beta}{dr}\cdot R\cdot\left[(\Delta s + \bar{p}\beta)\bar{p} + \beta\sigma_p^2\right] + \frac{1}{2}\cdot\frac{dR}{dr}\cdot\left[(\Delta s + \bar{p}\beta)^2 + \beta^2\sigma_p^2\right]. \qquad \text{(A4)}$$

Inserting $dR/dr = -1/r^2$ into (A4) and rearranging gives:

$$\frac{dE[TC]}{dr} = \frac{1}{2r^2}\cdot\left((\Delta s + \bar{p}\beta)\cdot\left[\bar{p}\cdot\left(2Rr^2\cdot\frac{d\beta}{dr} - \beta\right) - \Delta s\right] + \beta\sigma_p^2\cdot\left(2Rr^2\cdot\frac{d\beta}{dr} - \beta\right)\right). \qquad \text{(A5)}$$

To prove the sufficient conditions for decreasing expected total costs assume $\sigma_x^2 \to \infty$, then $\beta \to 1$ and $d\beta/dr \to 0$. (A5) yields:

$$\lim_{\sigma_x^2\to\infty}\frac{dE[TC]}{dr} = \frac{1}{2r^2}\cdot\left(-(\Delta s + \bar{p})^2 - \sigma_p^2\right) < 0.$$

If $\sigma_1^2 \to \infty$, then $\beta \to 0$ and $d\beta/dr \to 0$, implying:

$$\lim_{\sigma_1^2\to\infty}\frac{dE[TC]}{dr} = -\frac{1}{2r^2}(\Delta s)^2 < 0.$$

Part (iii): Inspection of (A5) reveals that if:

$$2Rr^2\cdot\frac{d\beta}{dr} - \beta > 0 \qquad \text{(A6)}$$

holds at a given $r \geq 1$, then for each $\bar{p} > 0$ it is always possible to find appropriate values $\Delta s \geq 0$ such that (A5) is still positive (recall that β does not depend on Δs, hence, the choice of Δs has no impact on the left-hand side of (A6)). If $\Delta s < 0$ and (A6) holds, then (A5) is certainly positive as long as $\Delta s + \bar{p}\beta \geq 0$, implying $\Delta s \geq -\bar{p}\beta \equiv \delta_1$. From Proposition 2:

$$\frac{d\beta}{dr} = \frac{2\beta^3 R\sigma_p^2 + \beta^2 c\sigma_p^2}{r^2(3\beta^2R^2\sigma_p^2 + 2\beta cR\sigma_p^2 + \sigma_x^2 + \sigma_1^2)}.$$

Therefore, (A6) becomes:

$$\begin{aligned} 2Rr^2 \cdot \frac{d\beta}{dr} - \beta &= \beta \cdot \left(\frac{4\beta^2R^2\sigma_p^2 + 2\beta cR\sigma_p^2}{3\beta^2R^2\sigma_p^2 + 2\beta cR\sigma_p^2 + \sigma_x^2 + \sigma_1^2} - 1\right) \\ &= \beta \cdot \left(\frac{4\beta^2R^2\sigma_p^2 + 2\beta cR\sigma_p^2 - (3\beta^2R^2\sigma_p^2 + 2\beta cR\sigma_p^2 + \sigma_x^2 + \sigma_1^2)}{3\beta^2R^2\sigma_p^2 + 2\beta cR\sigma_p^2 + \sigma_x^2 + \sigma_1^2}\right) \\ &= \beta \cdot \left(\frac{R^2\beta^2\sigma_p^2 - (\sigma_x^2 + \sigma_1^2)}{3\beta^2R^2\sigma_p^2 + 2\beta cR\sigma_p^2 + \sigma_x^2 + \sigma_1^2}\right). \end{aligned}$$

Since $\beta > 0$, this expression is positive if and only if $R^2\beta^2\sigma_p^2 > \sigma_x^2 + \sigma_1^2$. Next we show that $\beta^2\sigma_p^2$ increases in σ_p^2; therefore, there exist σ_p^2 above some lower bound that satisfy this condition. The derivative is:

$$\frac{d(\beta^2\sigma_p^2)}{d\sigma_p^2} = \beta \cdot \left(2 \cdot \sigma_p^2 \cdot \frac{d\beta}{d\sigma_p^2} + \beta\right).$$

Since $\dfrac{d\beta}{d\sigma_p^2} = -\dfrac{\beta^3R^2 + \beta^2 cR}{3\beta^2R^2\sigma_p^2 + 2\beta cR\sigma_p^2 + \sigma_x^2 + \sigma_1^2} < 0$ we have:

$$2\sigma_p^2 \cdot \frac{d\beta}{d\sigma_p^2} = -\beta \cdot \left(\frac{2\beta^2R^2 + 2\beta cR}{3\beta^2R^2 + 2\beta cR + \dfrac{\sigma_x^2 + \sigma_1^2}{\sigma_p^2}}\right) > -\beta.$$

Therefore, $\dfrac{d(\beta^2\sigma_p^2)}{d\sigma_p^2} > 0$. Hence, given $r \geq 1$ for any σ_x^2 and σ_1^2 the inequality:

$$R^2\beta^2\sigma_p^2 > \sigma_x^2 + \sigma_1^2$$

can be satisfied by sufficiently large σ_p^2, implying that:

$$2 \cdot R \cdot r^2 \frac{d\beta}{dr} - \beta > 0$$

is also satisfied. Since $\bar{p} > 0$, there exist $\Delta s \geq 0$ that satisfy:

$$\Delta s \leq \delta_2 \equiv \bar{p} \cdot \left(2 \cdot R \cdot r^2 \frac{d\beta}{dr} - \beta\right).$$

All values of Δs with $\delta_1 \leq \Delta s \leq \delta_2$ imply a positive derivative of the expected total costs (A5). This proves the sufficiency part of Proposition 4 (iii). If (A6) is nonpositive and $\Delta s \geq 0$, inspection of (A5) reveals that expected total costs cannot increase with tighter standards. This proves the necessity of sufficiently large σ_p^2 for $\Delta s \geq 0$.

Finally, because we restrict our analysis to equilibria with positive β, we show existence of appropriate values for σ_p^2 such that the condition $c^2\sigma_p^2 \geq 3(\sigma_x^2 + \sigma_1^2)$ in Proposition 1 (ii) for the existence of additional equilibria with $\beta < 0$ is not fulfilled. This requirement gives an upper bound for σ_p^2:

$$\sigma_p^2 < \frac{3(\sigma_x^2 + \sigma_1^2)}{c^2}$$

or, equivalently, $R^2\beta^2\sigma_p^2 < \beta^2 \cdot \frac{3R^2(\sigma_x^2 + \sigma_1^2)}{c^2}$. An appropriate choice of σ_p^2 must satisfy:

$$\sigma_x^2 + \sigma_1^2 < R^2\beta^2\sigma_p^2 < \beta^2 \cdot \frac{3R^2(\sigma_x^2 + \sigma_1^2)}{c^2} \Rightarrow \frac{c^2}{3R^2} < \beta^2.$$

For $r \rightarrow +\infty$, we have $R \rightarrow 1$, hence, the left-hand side converges to a maximum of $c^2/3$. Since $\beta^2 > 0$ in any equilibrium, there always exist values $c \geq 0$ such that this condition holds for any $r \geq 1$. ■

REFERENCES

Barton, J. 2001. Does the use of financial derivatives affect earnings management decisions? *The Accounting Review* 76: 1–26.

———, and P. J. Simko. 2002. The balance sheet as an earnings management constraint. *The Accounting Review* 77 (Supplement): 1–27.

Black, E. L., K. F. Sellers, and T. S. Manly. 1998. Earnings management using asset sales: An international study of countries allowing noncurrent asset revaluation. *Journal of Business Finance and Accounting* 25: 1287–1317.

Christensen, P. O., H. Frimor, and F. Sabac. 2004. Earnings management, revenue recognition, and depreciation in dynamic agency with renegotiation. Working paper, University of Southern Denmark.

Demski, J. S. 1998. Performance measure manipulation. *Contemporary Accounting Research* 15: 261–285.

———. 2004. Endogenous expectations. *The Accounting Review* 79: 519–539.

———, H. Frimor, and D. E. M. Sappington. 2004. Efficient manipulation in a repeated setting. *Journal of Accounting Research* 42: 31–49.

Dutta, S., and F. Gigler. 2002. The effect of earnings forecasts on earnings management. *Journal of Accounting Research* 40: 631–655.

Dye, R. A. 2002. Classifications manipulation and Nash accounting standards. *Journal of Accounting Research* 40: 1125–1162.

———, and S. S. Sridhar. 2004. Reliability-relevance trade-offs and the efficiency of aggregation. *Journal of Accounting Research* 42: 51–88.

Fischer, P. E., and R. E. Verrecchia. 2000. Reporting bias. *The Accounting Review* 75: 229–245.

———, and P. C. Stocken. 2004. Effect of investor speculation on earnings management. *Journal of Accounting Research* 42: 843–870.

Francis, J., R. LaFond, P. M. Olsson, and K. Schipper. 2004. Costs of equity and earnings attributes. *The Accounting Review* 79: 967–1010.

Hirshleifer, D., S. S. Lim, and S. H. Teoh. 2002. Disclosure to a credulous audience: The role of limited attention. Working paper, The Ohio State University.

International Accounting Standards Board (IASB). 2003. *Improvements to International Accounting Standards*. London, U.K.: IASB.

Jiambalvo, J. 1996. Discussion of: Causes and consequences of earnings manipulation: An analysis of firms subject to enforcement actions by the SEC. *Contemporary Accounting Research* 13: 37–47.

Kirschenheiter, M., and N. D. Melumad. 2002. Can "big bath" and earnings smoothing co-exist as equilibrium financial reporting strategies? *Journal of Accounting Research* 40: 761–796.

Liang, P. J. 2004. Equilibrium earnings management, incentive contracts, and accounting standards. *Contemporary Accounting Research* 21: 685–717.

Marquardt, C. A., and C. I. Wiedman. 2004. How are earnings managed? An examination of specific accruals. *Contemporary Accounting Research* 21: 461–491.

Sankar, M. R., and K. R. Subramanyam. 2001. Reporting discretion and private information communication through earnings. *Journal of Accounting Research* 39: 365–386.

Schipper, K. 2003. Principles-based accounting standards. *Accounting Horizons* (March): 61–72.

Stocken, P. C., and R. E. Verrecchia. 2004. Financial reporting system choice and disclosure management. *The Accounting Review* 79: 1181–1203.

THE ACCOUNTING REVIEW
Vol. 80, No. 4
2005
pp. 1125–1162

Disclosure Incentives and Effects on Cost of Capital around the World

Jere R. Francis
University of Missouri–Columbia and University of Melbourne

Inder K. Khurana
University of Missouri–Columbia

Raynolde Pereira
University of Missouri–Columbia

ABSTRACT: Prior research predicts that firms reliant on external financing are more likely to undertake a higher level of disclosure, and a higher disclosure level should, in turn, lead to a lower cost of external financing. This paper tests these predictions outside the United States where alternative legal and financial systems could mitigate the effectiveness of such disclosures and, comprehensively, examines both disclosure incentives and disclosure consequences on cost of capital for a common set of firms. Using a sample from 34 countries, we find that firms in industries with greater external financing needs have higher voluntary disclosure levels, and that an expanded disclosure policy for these firms leads to a lower cost of both debt and equity capital. Cross-country differences in legal and financial systems affect observed disclosure levels in predicted ways. However, a surprising result in the study is that voluntary disclosure incentives appear to operate *independently* of country-level factors, which suggests the effectiveness of voluntary disclosure in gaining access to lower cost external financing around the world.

Keywords: *voluntary disclosure; cost of capital; external financing.*

Data Availability: *Data are publicly available from sources identified in the paper.*

I. INTRODUCTION

This study examines if firm-level incentives for voluntary disclosures are a mechanism to lower the firm's cost of capital in countries outside the United States where institutional differences in legal and financial systems could limit the effectiveness of such disclosures. Extant theory posits that adverse selection costs due to information asymmetry create a divergence between the costs of external and internal funds, thereby

---

We appreciate the comments of workshop participants at Baruch College, City University of Hong Kong, University of Melbourne, University of Missouri–Columbia, Yale University, conferees at the 2003 Midyear Meeting of the International Accounting Section of the American Accounting Association, and two anonymous reviewers. We also appreciate the research assistance of Xiumin Martin.

Editor's note: This paper was accepted by Terry Shevlin, Senior Editor.

Submitted September 2003
Accepted January 2005

constraining firms in their ability to fund investment projects (Hubbard 1998; Stein 2001). However, a related and important line of inquiry in accounting argues that an expanded disclosure policy mitigates adverse selection costs by reducing information asymmetry between inside managers and outside investors (Healy and Palepu 2001; Verrecchia 2001). Two empirical implications flow from this view. First, theory predicts a positive relation between a firm's dependence on external financing and its disclosure level because the cost of external financing is of greater consequence for firms with limited internal resources relative to their investment opportunities. Second, an expanded disclosure policy has been posited to lead to a lower cost of external financing if disclosure mitigates information asymmetry (Amihud and Mendelson 1986; Verrecchia 1983).

Prior empirical research linking voluntary disclosure with financing incentives and cost of capital effects has mainly been undertaken in the context of the United States (e.g., Frankel et al. 1995; Lang and Lundholm 1993, 2000; Botosan 1997; Sengupta 1998). The United States has well-developed financial markets with strong investor protection (La Porta et al. 1998), and is generally viewed as having a frictionless financial market with relatively easy access to external financing. Therefore, it is unclear if findings based on U.S. markets necessarily generalize to countries with different legal or financial systems. There are two specific reasons why voluntary disclosure and the associated benefits of voluntary disclosure are not likely to occur in countries outside the U.S.: first, disclosures may not be viewed as credible if a country's legal system provides weak protection for investors; and second, there is less need for voluntary "public" disclosure if firms operate in countries with predominantly bank-centered financial systems.[1]

In this study, we investigate if disclosure policy is an instrument for mitigating information asymmetry in settings where the underlying institutions differ considerably from the U.S. in terms of investor protection and the development of financial markets. Using a sample of 672 observations from 34 countries with a broad range of legal and financial systems, we first examine if voluntary disclosure incentives exist as a function of a firm's external financing needs, and second, we determine if a firm's disclosure policy is associated with a lower cost of external financing. This is the first study that comprehensively examines both disclosure incentives and disclosure consequences on cost of capital for a common set of firms.

We find individual firms across *all* countries have higher voluntary disclosure levels if they are in industries with a greater need for external financing, and they benefit from expanded disclosure by having a lower cost of both debt and equity capital. Importantly, these results hold after controlling for cross-country institutional differences in legal and financial systems. These findings support the theoretical predictions on voluntary disclosure in international settings, despite cross-country variations in legal and financial systems that might limit disclosure incentives and benefits, and underscore the global viability of voluntary disclosures in gaining access to lower cost external financing.

Our study adds to the growing literature on cross-country differences in disclosures and their determinants. Studies by Bushman et al. (2004) and La Porta et al. (1998) examine cross-country variation in corporate disclosures aggregated at the country level. More recently, Jaggi and Low (2000) and Hope (2003) examine the impact of country characteristics and firm-level incentives on disclosure policy. However, none of these studies examines the role of voluntary disclosure as a function of a firm's external financing needs in a cross-country setting. Moreover, these studies do not examine the impact of voluntary disclosure on the cost of external financing.

---

[1] These two points are inter-related. Countries with weaker investor protection also tend to have financial systems that are relatively more bank-based precisely because broad-based equity markets are relatively unattractive due to the weak investor protection environment (Ali and Hwang 2000).

Our study also complements recent work by Bhattacharya et al. (2003), who examine the association between earnings opacity and cost of equity capital at the country-level, and by Hail and Leuz (2003), who explore the link between securities regulation and the cost of equity capital at the country-level. However, our study differs in the following ways: we conduct our analysis at the *firm*-level rather than the *country*-level of analysis; we focus specifically on voluntary disclosures; and we examine the firm-level cost of both debt and equity capital. Importantly, we demonstrate that the level of voluntary disclosure is an additional factor influencing a firm's cost of capital.

The remainder of the paper is organized as follows. Section II develops the study's hypotheses, and Section III describes the data and the sample. Section IV reports the disclosure incentive tests based on external financing dependence, and Section V presents the analysis of disclosure consequences on the cost of debt and cost of equity capital. Section VI summarizes and concludes the study.

II. HYPOTHESIS DEVELOPMENT

Market imperfections in the form of information asymmetry create a wedge between a firm's internal and external cost of funds. As a result, firms unable to gain access to lower cost of external financing could be forced to forgo potentially profitable projects. Within this context, disclosure policy emerges as a mechanism that can mitigate information asymmetry and lower firms' cost of external financing (e.g., Choi 1973; Verrecchia 1983). As a consequence, disclosure improves the firms' ability to fund profitable projects (Bushman and Smith 2001; Stein 2001).

Despite the benefits of voluntary disclosure, extant theory points to the existence of an interior optimal level of disclosure (Verrecchia 1983). This result is obtained because an optimal level of voluntary disclosure involves a trade-off between the benefit of a lower cost of external financing and the cost of revealing proprietary information (e.g., Hayes and Lundholm 1996). The cost of external financing is particularly important for firms with limited internal cash flows relative to their investment opportunities. For these firms, an inability to access lower cost external financing can force them to forgo potentially profitable projects. Therefore, extant theory predicts that firms more dependent on external financing, either debt or equity, are more likely to undertake a higher level of voluntary disclosure.[2]

U.S. empirical evidence is consistent with the view that voluntary public disclosure reduces information asymmetry and facilitates a firm's access to lower cost external financing.[3] Other studies link voluntary disclosures with factors that contribute to a lower cost of capital. For example, Frankel et al. (1995) find that firms that access external financing markets are more likely to issue management earnings forecast. Similarly, Healy et al. (1999) find that firms expand their disclosure policy prior to raising funds in public as opposed to private capital markets. Prior studies also document a negative relation between a firm's level of voluntary disclosure and its cost of both debt capital (Sengupta 1998) and equity capital (Botosan 1997; Botosan and Plumlee 2002).

---

[2] Prior research also indicates that disclosure can reduce the estimation risk of payoff distribution and that the market prices the reduction of estimation risk (e.g., Barry and Brown 1985; Coles et al. 1995; Handa and Linn 1993). To the extent that disclosure lowers the perceived estimation risk as well as the information asymmetry between the firm and its current and potential stockholders, firms that disclose more are expected to benefit in the form of a lower cost of capital.

[3] For example, Welker (1995) finds that voluntary disclosure lowers a firm's bid-ask spread. Healy et al. (1999) find improved analysts' coverage and stock liquidity after firms implemented an expanded voluntary disclosure policy.

Despite this body of evidence, we might not observe the disclosure-external financing linkage and the disclosure-cost of capital relation outside the United States because of differences in (1) legal environments with respect to investor protection, and (2) country financial structures (i.e., the degree to which it is bank-based or market-oriented). If disclosures are not viewed as credible in countries with weak investor protection, then there would be no benefit from voluntary disclosures and therefore no incentive to disclose. There is evidence that countries with weak investor protection environments have lower quality accounting standards and lower quality auditing, which means that accounting is less credible in these countries (La Porta et al. 1998; Hung 2000; Francis et al. 2003).

Country financial structures vary in terms of the degree to which they are bank-based or market-oriented. A market-oriented financial system relies on public equity markets to supply capital financing (rather than private banks), and a strong equity market with a diverse group of shareholders is conducive to the production of extensive information (Doupnik and Salter 1995). Verrecchia (1983, 1990) demonstrates that even if disclosure is costly because of product market consequences, managers trade-off these costs against the benefit of expanded disclosure in mitigating information asymmetry. Healy and Palepu (2001) note that expanded disclosure can improve intermediation for a firm's stock in the capital market. In addition, when financial claims are widely held, public disclosure also serves as an effective mechanism for relaying credible information to attenuate the higher cost of capital due to information asymmetry (Ball et al. 2000). Therefore, a higher level of disclosure is expected in countries having more market-oriented financial systems.[4] In contrast, bank-based financing arrangements facilitate a credible exchange of private information that reduces managers' incentives to disclose information publicly (e.g., Healy and Palepu 1993; Baiman and Verrecchia 1996; Ali and Hwang 2000). However, note that there are equity markets in countries with more bank-oriented systems, and therefore voluntary public disclosure could still be important as a means of accessing equity financing as well as creating greater transparency for private debt financing.

Based on the arguments offered in the literature, it remains an empirical question whether the predictions derived from extant theory hold for a cross-country sample outside the U.S. The research discussed above leads to the following two hypotheses (stated in alternate form):

H1: There is a positive association between the firm's need for external financing and the level of voluntary disclosure.

H2: There is a negative association between cost of capital and the firm's voluntary disclosure level.

III. DATA SOURCES AND SAMPLE

This section describes the data sources and the sample. The sample firms and disclosure data come from the Center for International Financial Analysis and Research data base

---

[4] Some prior cross-country accounting studies have related the information content, timeliness, and value-relevance of accounting earnings to a country's capital market characteristics (Jacobson and Aaker 1993; Harris et al. 1994; Ali and Hwang 2000). These studies view the financial structure of a country as an important criterion for distinguishing financial reporting requirements as well as properties of accounting numbers.

(CIFAR 1993, 1995). The benchmark variable for industry financing dependence is based on data reported in Rajan and Zingales (1998). Rajan and Zingales (1998) measure an industry's dependence on external financing for 35 manufacturing industries in the United States, and they use the data to benchmark an industry's inherent need for external financing in 41 different countries around the world.[5] Data for firm-specific control variables are from Global Vantage, I/B/E/S, and Moody's International manuals. All the firm-specific control variables employed in this study are calculated using financial statement data for the fiscal year on which the CIFAR disclosure scores are based. The control variable for legal system comes from La Porta et al. (1998) and the control variable for a country's financial structure uses data developed by Beck and Levine (2000), i.e., the degree to which a country has a market-oriented versus bank-based financial system. Control variables for a country's macro-economic conditions come from the International Monetary Fund (IMF 2003).

Our initial sample consists of firms with disclosure scores for either the fiscal year 1991 or 1993 as reported in the CIFAR (1993, 1995) data base covering 42 countries.[6] This initial sample is then restricted to the set of firms from all countries (except the U.S.) in the CIFAR data base that are also in the corresponding set of manufacturing industries in Rajan and Zingales (1998) for which they develop benchmark measures of industry financing dependence.[7] Consistent with Rajan and Zingales (1998) we confine our analysis to manufacturing industries in order to reduce the effect of country-specific factors like natural resources that are typically more important in developing economies than in developed economies. In addition, the manufacturing sector is less likely to have mandatory or specialized accounting standards and disclosures that might affect firm-level CIFAR disclosure scores. Industries are classified by Rajan and Zingales (1998) using the International Standard Classification Code (ISIC). This screening process, together with the constraint that necessary data be available for the explanatory variables used in the regression model, results in 672 firm-year observations (484 unique firms) covering 19 of the 35 manufacturing industries in Rajan and Zingales (1998), and 34 of the 42 countries in CIFAR. For the cost of capital tests, there are fewer observations due to additional data limitations.

IV. TESTS OF DISCLOSURE INCENTIVES

Empirical Model

The impact of external financing dependence on the level of voluntary disclosure, as predicted by H1, is examined using the following regression model in Equation (1):

---

[5] Rajan and Zingales (1998) examine if differences in countries' financial systems affect economic growth in those industry sectors that are more dependent on external financing. They conjecture that countries with more developed financial systems can provide a lower cost of external financing, and that this is the channel through which financial development drives a country's growth. Consistent with this conjecture they find that the level of a country's financial development is positively associated with the economic growth of industry sectors most dependent on external finance. Beck and Levine (2002) further examine the data in Rajan and Zingales (1998) and reaffirm that the overall level of a country's financial development drives industry growth, and that it does not matter whether a country has a market-oriented or bank-based financial system. They also find that a country's level of overall financial development is fostered by a legal system that provides strong investor protection (La Porta et al. 1998).

[6] Hope (2003) reports that CIFAR (1993, 1995) covered 986 and 1,006 firms in 1993 and 1995 editions, respectively, out of which 558 firms were included in both years. CIFAR selects companies based on sales and assets within the country and countrywide proportions were based on quantitative factors such as market capitalization and GNP and on factors such as relative position of a country in the global economy. CIFAR (1995) notes that their evaluations cover most of the leading industrial companies from each country.

[7] Firms from the U.S. are excluded from our sample because the U.S. is used to benchmark an industry's external financing dependence.

$$DISC_{ijk} = f(EXTDEP_j, YR, LASSET_i, LEV_i, CROSS\_LIST_i, ANTIDIR_k, STRUCTURE_k) \quad (1)$$

The variables in Equation (1) are defined below and an expanded discussion of the variables follows:

$DISC$ = a metric that captures the total disclosure score over and above the country-level minimum score for a firm i in industry j in country k;
$EXTDEP_j$ = the measure of dependence on external financing for industry j as measured for a sample of U.S. companies over the period 1980–89;
YR = an indicator variable coded 1 if disclosure scores are from 1993, and 0 if from 1991;
$LASSET_i$ = natural log of total assets (measured in millions of U.S. dollars) of a firm i;
LEV_i = the ratio of short- and long-term debt to total assets of firm i;
$CROSS\_LIST_i$ = an indicator variable that takes the value of 1 for a firm i cross-listed in a foreign stock exchange, and 0 otherwise;
$ANTIDIR_k$ = a measure of the legal environment with respect to investor protection in country k; and
$STRUCTURE_k$ = a measure of financial structure over the period 1980–89 for country k.

The test variable in the regression model is *EXTDEP*, which represents an industry-based measure of a firm's external financing dependence. The model in Equation (1) tests the association of *EXTDEP* with firm-level disclosures as a separate and independent effect, over and above the disclosure effects of the country-level variables *ANTIDIR* and *STRUCTURE.* However, it is possible that *EXTDEP* is significantly associated with higher disclosure only in countries similar to the United States with stronger investor protection and more developed equity markets where disclosure incentives might be more salient. It turns out that this is not the case, and we report tests at the end of Section IV, which examine the interaction of *EXTDEP* with *ANTIDIR* and *STRUCTURE.*

Dependent Variable—Accounting Disclosure

The level of accounting disclosure for our sample firms is obtained for the 1991 and 1993 fiscal years from CIFAR (1993, 1995). In the early 1990s, CIFAR created disclosure scores by rating the annual reports of at least three firms in every country for inclusion or omission of 90 specific items. The last edition in this series is CIFAR (1995), which reported data for the year 1993. The 90 items in the index are based on the presence of specific disclosures in the following seven categories: general information (8 items), income statement (11 items), balance sheet (14 items), funds flow statement (5 items), accounting policy disclosure (20 items), shareholders' information (20 items), and other supplementary information (12 items). The disclosure scores are quantitative (presence/absence) in nature rather than qualitative or evaluative. Each firm within a country obtains a score out of 90, with a higher number indicating a greater level of total public disclosure.[8]

---

[8] These disclosure scores have been used as a measure of public disclosure in a number of studies, including Bushman et al. (2004), Khanna et al. (2000), and Hope (2003). Furthermore, while Khanna et al. (2000) find a significantly positive relation between analyst forecast accuracy and these disclosure scores aggregated at the country level, Hope (2003) shows that these disclosure scores at the firm level are positively associated with analyst forecast accuracy, suggesting that the scores represent disclosure activity that conveys useful information. Hope (2003) also shows that these disclosure scores are significantly correlated with independently constructed rankings of annual report disclosures.

It is important to note that the CIFAR disclosure scores represent elements of both mandated disclosures and voluntary disclosures. The mandated disclosures are expected to be systematically associated with a country's legal system and financial structure, and we control for these country-level effects (as discussed below). However, to potentially better isolate a measure of voluntary disclosure, we derive two disclosure metrics to remove country-level mandated disclosure. The first disclosure metric is *DISC_RAW* and is computed as the CIFAR disclosure score over and above the minimum CIFAR disclosure score (based on the full CIFAR sample) for the country in which the firm is incorporated. As such, *DISC_RAW* reflects an *absolute increase* in disclosure. The second metric, *DISC_SCALED*, is the increase in firm's disclosure score over the country-minimum score (based on the full CIFAR sample), scaled by the country-minimum score, and represents a *relative percentage increase* in disclosure over the country-minimum.[9]

In our context, an empirical issue is whether an absolute or a relative increase in disclosure is the appropriate metric for the level of voluntary disclosure. For example, consider a country with a minimum score of 10 versus another with a country-level minimum score of 50. It is possible that large external financing needs could lead to either an absolute increase (say 5 disclosure points) or a percentage increase. A 20 percent increase on a country-level minimum score of 10 is 2 points, while a 20 percent increase on a country-level minimum score of 50 is 10 points. In the absence of a theory to guide whether we expect an absolute or relative percentage increase in disclosure to be related to external financing needs, we report results using both metrics. Importantly, both metrics attempt to remove the effect of mandated country-specific disclosures.[10]

Table 1 summarizes the distribution of the sample across the 19 industries, along with the benchmark measure of the industry's external financing dependence from Rajan and Zingales (1998). Note that all 19 industries are not necessarily present in each country. Table 2 summarizes the distribution across the 34 countries in the sample. Table 2 also provides information about the United States as a benchmark for our sample, and median disclosure for U.S. firms is higher (76) than for non-U.S. firms (72) as expected. The standard deviation of firm-level CIFAR disclosure scores for each country is around 10 percent of the country mean, indicating that there is within-country variation in CIFAR disclosure scores. Also, mean values of the CIFAR disclosure scores are much higher than the minimum country-level scores. Taken together, these findings are consistent with the notion that accounting disclosure has a discretionary element and that CIFAR data convey more information than just the disclosures mandated by accounting standards within a country.

Test Variable—Industry External Financing Dependence

Rajan and Zingales (1998) define an industry's external financing dependence as the average ratio of capital expenditures financed with external funds for U.S. firms in the same manufacturing industry averaged for the period 1980–1989.[11] Specifically, they compute a

---

[9] *DISC_SCALED* is defined as [(firm's CIFAR disclosure score – Country minimum CIFAR Disclosure Score)/ Country minimum CIFAR Disclosure Score], or equivalently the firm's CIFAR disclosure score/Country minimum CIFAR Disclosure Score minus 1.

[10] As a sensitivity test, we also computed our disclosure metrics using minimum industry CIFAR scores within each country, and these results are qualitatively the same as those reported using country-adjusted minimum scores.

[11] Rajan and Zingales (1998) compute external financing dependence metric by aggregating data over a long period (such as the 1980s) to smooth temporal fluctuations and to reduce the effects of outliers.

TABLE 1
External Financing Dependence and CIFAR Disclosure Scores across Industries

ISIC code	Industrial Sector	External Dependence	CIFAR Disclosure Score n	 Mean	 Median	 Std. Deviation
314	Tobacco	−0.45	10	69.30	68.00	13.70
322	Apparel	0.03	17	71.72	72.50	15.41
311	Food products	0.14	94	77.24	78.00	8.39
341	Paper and paper products	0.18	39	74.54	79.00	12.89
342	Printing and publishing	0.20	24	76.54	77.50	8.56
352	Other chemicals	0.22	50	74.90	75.00	9.63
381	Metal products	0.24	70	72.67	73.00	7.95
3511	Basic industrial goods excl. fertilizers	0.25	36	70.28	69.00	10.18
384	Transportation equipment	0.31	20	75.30	76.50	9.47
354	Petroleum and coal products	0.33	102	70.32	71.50	11.28
3843	Motor vehicles	0.39	60	69.03	71.00	11.98
390	Other industries	0.47	5	69.00	67.00	13.73
362	Glass	0.53	17	70.82	71.00	8.59
383	Electric machinery	0.77	27	75.44	77.00	10.61
385	Professional and scientific goods	0.96	9	77.22	78.00	8.00
3832	Radios	1.04	2	70.50	70.50	10.61
3825	Office and computing products	1.06	58	76.22	77.00	8.47
356	Plastic products	1.14	12	75.33	76.00	8.11
3522	Drugs	1.49	20	79.25	79.50	7.91
	Total	0.49	672	73.46	74.05	10.29

External Dependence is the average ratio of capital expenditures financed by external funds for U.S. firms in the same industry between 1980–1989. Source: Rajan and Zingales (1998).

CIFAR Disclosure Score is the 90-point index created by examining and rating companies' 1991 and 1993 annual reports on their inclusion or omission of 90 specific items. These items fall into seven categories (general rating information, income statements, balance sheets, fund flow statements, accounting standards, stock data, and special items). A minimum of three companies in each country was studied. A higher value indicates more public disclosure. Source: CIFAR (1993, 1995).

n = the number of firm-year observations for 1991 and 1993.

firm's dependence on external finance as capital expenditures minus cash flow from operations for each year in the 1980s, aggregate a firm's use of external finance over the 1980s, and then divide the aggregated amount by the sum of capital expenditures over the 1980s to get a firm's dependence on external finance.[12] They then use the industry median of this

---

[12] Formally, this is defined as:

$$EXTDEP_i = \frac{\sum_{t=1980}^{1989} (CAPX_{it} - CFO_{it})}{\sum_{t=1980}^{1989} CAPX_{it}}$$

where $CAPX$ = capital expenditures for firm i in year t, and CFO = cash flow from operations for firm i in year t.

TABLE 2
Descriptive Statistics of Firm-Level CIFAR Disclosure Scores across Countries and Country-Level Proxy of Legal Environment and Financial Structure

Panel A: Firm-Level CIFAR Disclosure Scores

	Firm Level				
Country	**n**	**Mean**	**Median**	**Min**	**Std.**
Australia	39	79.44	80.00	65.00	5.17
Austria	11	56.18	57.00	43.00	7.21
Belgium	12	69.00	69.00	59.00	5.72
Brazil	10	55.33	60.00	16.00	17.11
Canada	48	74.15	75.00	56.00	7.05
Chile	2	64.50	64.50	62.00	3.54
Columbia	4	62.75	61.50	59.00	4.50
Denmark	16	73.25	73.00	51.00	9.73
Finland	18	79.67	80.50	52.00	8.49
France	54	77.67	79.00	62.00	6.85
Germany	64	66.42	66.00	46.00	7.79
Greece	3	63.33	61.00	58.00	6.81
India	17	56.94	55.00	45.00	9.20
Israel	7	66.29	71.00	50.00	11.80
Italy	11	68.09	68.00	50.00	8.63
Japan	106	72.48	74.00	44.00	6.85
Mexico	6	69.67	69.50	62.00	4.68
Malaysia	15	76.27	77.00	69.00	4.77
Nigeria	2	65.50	65.50	64.00	2.12
The Netherlands	18	72.78	74.50	53.00	8.48
Norway	15	76.87	77.00	47.00	9.36
New Zealand	8	77.75	80.00	66.00	8.07
Pakistan	3	73.67	73.00	71.00	3.06
Phillipines	8	67.63	66.50	63.00	4.07
Portugal	8	54.25	56.50	32.00	11.18
Singapore	13	75.08	77.00	51.00	8.39
Spain	8	65.38	63.50	50.00	12.72
Sweden	23	83.65	85.00	71.00	6.09
Turkey	2	65.00	65.00	64.00	1.41
South Africa	22	76.00	77.00	59.00	7.92
South Korea	3	64.33	64.00	62.00	2.52
Sri Lanka	5	75.20	74.00	68.00	5.36
United Kingdom	88	83.49	84.00	49.00	6.93
Zimbabwe	3	71.33	73.00	63.00	7.64
Mean	20	69.98	70.49	55.35	7.09
Median	11	70.50	72.00	58.50	6.99
Std. Deviation		7.76	8.02	11.49	3.22
United States	305	75.82	76	59	4.42

(*continued on next page*)

TABLE 2 (Continued)

Panel B: Legal Environment and Financial Structure

Country	Country *ANTIDIR*	Country *STRUCTURE*
Australia	4	0.05
Austria	2	−2.80
Belgium	0	−0.27
Brazil	3	−0.30
Canada	5	−0.06
Chile	5	−0.75
Columbia	3	−1.47
Denmark	2	−0.90
Finland	3	−1.33
France	3	−1.73
Germany	1	−1.59
Greece	2	−1.62
India	5	−1.53
Israel	3	−0.56
Italy	1	−1.57
Japan	4	−0.35
Mexico	1	−0.81
Malaysia	4	0.11
Nigeria	3	−1.41
The Netherlands	2	−0.75
Norway	4	−1.38
New Zealand	4	0.62
Pakistan	5	−1.70
Phillipines	3	−1.17
Portugal	3	−2.66
Singapore	4	0.39
Spain	4	−1.55
Sweden	3	−0.30
Turkey	2	−2.10
South Africa	5	0.88
South Korea	2	−1.03
Sri Lanka	3	−0.97
United Kingdom	5	0.15
Zimbabwe	3	−0.47
Mean	3.12	−0.91
Median	3.00	−0.94
Std. Deviation	1.32	0.88
United States	5	−0.24

CIFAR Disclosure Score is the 90-point index created by examining and rating companies' 1991 and 1993 annual reports on their inclusion or omission of 90 specific items. These items fall into seven categories (general rating information, income statements, balance sheets, fund flow statements, accounting standards, stock data, and special items). A higher value indicates more disclosure, and the amounts in this table are the mean/median/minimum/standard deviation for the number of firms (n) in each country. Source: CIFAR (1993, 1995).

ANTIDIR = an index based on six specific elements of investor protection dealing with ability of outsider investors to challenge the control of the firm by inside owners and directors. Source: La Porta et al. (1998).

STRUCTURE = log of (ratio of stock market capitalization to claims on the private sector by commercial banks). Source: Beck and Levine (2000).

variable for all firms in an industry to derive external dependence for industries. This external dependence measure is used in our study and is denoted *EXTDEP*.[13] Higher values of *EXTDEP* indicate greater external financing dependence. Hypothesis 1 predicts firms in industries with a higher need for external financing will disclose more, and the coefficient on the test variable *EXTDEP* is therefore expected to be positive.[14]

Table 1 reports industry benchmarks for external financing from Rajan and Zingales (1998), ranked from lowest to highest for the 19 industries in our study. The drug industry is most dependent on external finance, while the tobacco industry's value of external dependence measure is negative. The negative value of external financing dependence means the tobacco industry generates excess cash flows relative to its capital expenditures and hence should have no demand for external finance.

Rajan and Zingales (1998) argue that "there is a technological reason why some industries depend more on external financing than others." For example, relative to the tobacco industry, which has low financing needs, the drug (pharmaceutical) industry has a high need for external financing due to high initial start-up costs (research and development), and a longer time period before cash flows are realized. In this case, we would expect the pharmaceutical industry to have an ongoing higher demand for external financing than the tobacco industry. Following Rajan and Zingales (1998), we assume these relationships are intrinsic and hold across all countries. That is, the intrinsic technological and structural demand for more external funds by the pharmaceutical industry relative to the tobacco industry exists in all countries, independently of a specific country's legal and financial systems. Assuming that technological factors drive the demand for external financing, the empirical issue is one of identifying and measuring this demand. Rajan and Zingales (1998) argue that examining industry behavior in frictionless financial markets can best capture an industry's inherent demand for external financing. This is why they use external dependence of industries in the United States, which has a very well-developed financial system, to proxy for the dependence of industries (and firms within these industries) on external finance in the absence of market frictions.[15]

---

[13] An alternative way to measure external financing dependence would be to determine the actual external financing used by firms in industries across countries. However, Rajan and Zingales (1998) point out that the actual level of funds raised will be a function of equilibrium supply and demand for external funds in a country. In other words, firm-level measures of *actual* external financing are endogenous to the effects of a country's legal and financial systems. Since we are interested in distinguishing between firm-level incentives and endogenous institutional factors that have bearing on external financing, and in turn on disclosure behavior, it is necessary to use an exogenous measure; this is the purpose of benchmarking to U.S. industry data. While the U.S. industry data is also based on actual firm-level data, Rajan and Zingales (1998) note that examining industry behavior in frictionless financial markets such as the U.S., can best capture an industry's inherent demand for external financing.

[14] The argument in Rajan and Zingales (1998) is supported by evidence that disclosure quality is higher for firms in the U.S. in industries with a greater need for external financing. To demonstrate that this is the case we use analysts' yearly evaluations of firm disclosure practices published in the Association of Investment Management and Research's *Annual Review of Corporate Reporting Practices* (AIMR reports) for the years 1982 to 1995, a time period that corresponds to the data in Rajan and Zingales (1998). There are 28 common industries between these two data sources, and we use the AIMR database to correlate firm-level disclosure scores of analysts with external financing needs for these 28 industries using the industry benchmark measure in Rajan and Zingales (1998). Yearly Pearson product-moment correlations between the analyst's evaluations of disclosures and the level of external financing (for the firm's industry) are positive and significant ($p < .05$) in every year, and range in value from a low of 0.19 (in 1983) to a high of 0.55 (in 1995). Thus, there is clear evidence that firms in industries with a higher need for external financing in the U.S. also have a higher level of disclosure as assessed by leading analysts. The objective of our study is to determine if this disclosure-external financing relation holds *outside* the U.S., using the CIFAR database to measure voluntary accounting disclosure levels.

Time-Specific and Firm-Specific Control Variables

The sample includes firm-level data for two years. Because some firms have observations for both years, the control variable *YR* controls for any systematic year effect in disclosure scores.

We include firm-specific variables in the regression model to control for factors that have been shown to be associated with voluntary disclosures. Using data from the U.S., Lang and Lundholm (1993) model disclosure scores as a function of the firm's structural environment (that is likely to be stable over time), performance (that is likely to vary over time), and activity in the public capital market. However, in the absence of evidence on the generalizability of results in Lang and Lundholm (1993) to an international sample, we identify an alternative set of firm-specific control variables based on Ahmed and Courtis' (1999) survey of research on the determinants of disclosure.

Ahmed and Courtis (1999) provide a meta analysis of the results of 29 independent single country studies of the association between disclosure levels and firm characteristics. These studies cover disclosure levels in 17 individual countries ranging from Bangladesh to the United States. Ahmed and Courtis' (1999) analysis focuses on five firm-specific variables commonly used in these studies to explain disclosure levels: firm size, profitability, leverage, listing status, and audit firm size. Their analysis confirms significant and positive relationships between disclosure levels and firm size, leverage, and listing status. However, they find no significant association between disclosure levels and firm profitability or size of the audit firm.[16]

Based on the meta analysis of Ahmed and Courtis (1999), we include firm size, cross-listing, and leverage as firm-level control variables.[17] While firm size can proxy for many influences (Ball and Foster 1982), prior research has offered several explanations for a positive relation between disclosure and firm size. One explanation is that larger firms have greater analyst following and hence are better able to distribute firm-specific information through public disclosure (King et al. 1990). Also, if average cost of disclosure decreases as firm size increases, disclosure is expected to increase in firm size (Lang and Lundholm 1993; Bamber and Cheon 1998). We measure firm size (denoted as *LASSET*) as the natural log of total assets (in millions of U.S. dollars). The coefficient on the variable *LASSET* is expected to be positive.

---

[15] To examine whether industries with a higher need for external financing (as computed by Rajan and Zingales [1998]) actually have higher realizations of external financing, we used all firms on Global Vantage that belong to the same industries and countries as our sample firms to compute *realized* external financing during 1994–2000 for the industries in our sample. The Pearson product-moment correlation between *EXTDEP*, the external financing dependence measure of Rajan and Zingales (1998), and our measure based on actual realizations is 0.48, which is statistically significant at $p = 0.03$ and indicates that industries outside the U.S. exhibit actual external financing patterns similar to those documented by Rajan and Zingales (1998) using U.S. data.

[16] On this basis we exclude profitably and an auditor variable. However, as a sensitivity analysis we include return on assets and an indicator variable that takes on the value of 1 for Big 8 auditor, and 0 otherwise, as additional firm-specific controls in our regression models. While the return on assets was statistically significant ($p < 0.05$) with a positive sign in a few estimations, the auditor size dummy was never statistically significant ($p > 0.10$). More importantly, inclusion of these variables did not alter our inferences with respect to our test variable, *EXTDEP*.

[17] While we have drawn on prior research to identify and control for firm-level factors that affect disclosure policy and disclosure levels, we cannot rule out that we have we have omitted an important firm-level variable that is correlated with our test variable *EXTDEP* resulting in a classic correlated omitted variable problem.

The inclusion of leverage is consistent with the prior literature (e.g., Leftwich 1981), which posits that the greater the financial leverage, the higher the agency costs arising from managerial discretion to shift resources away from debt-holders, and the greater the demand for monitoring and disclosure. In our context, financial leverage also provides a control for the use of debt financing in lieu of equity financing. We measure leverage (denoted as *LEV*) as the ratio of the sum of short- and long-term debt to total assets. The coefficient on the variable *LEV* is expected to be positive.

Prior research has documented a positive association between cross-listing and a firm's level of disclosure. A reason offered for this finding is that cross-listed firms are subject to more scrutiny by foreign investors and regulators (Lang et al. 2003; Reese and Weisbach 2003). We use an indicator variable (denoted as *CROSS_LIST*) that takes the value of 1 for a firm cross-listed in a foreign stock exchange, and 0 otherwise. The coefficient on the variable *CROSS_LIST* is expected to be positive.

Country-Specific Factors

As noted previously, two reasons we might not observe the disclosure-external financing linkage outside the United States relate to different legal environments with respect to investor protection, and a country's financial structure (i.e., the degree to which it is bank- or market-based). If accounting disclosures are not credible in countries with weak investor protection, then there would be no benefit from voluntary disclosures and therefore no incentive to disclose. In addition, we might not also observe the disclosure-external financing linkage outside the United States if a country's financial structure is more bank-based rather than market-oriented. Therefore, we control for the effects on accounting disclosure due to a country's legal system and financial system.

Specifically we use the antidirector rights' index developed by La Porta et al. (1997, 1998) to capture the effect of a country's legal environment with respect to investor protection.[18] Larger values of antidirector rights' index indicate that minority shareholders are better protected against expropriation by management and large shareholders, and higher disclosure levels are expected in such countries due to the demand for greater transparency (La Porta et al. 1998). This index is based on six specific elements of investor protection dealing with the ability of outsider investors to challenge the control of the firm by inside owners and directors. Country-level scores can range from 0 to 6 based on the sum of six indicator variables that reflect shareholder rights: (1) the ability to vote by mail, (2) the ability to gain control of shares during the shareholder's meeting, (3) the possibility of cumulative voting for directors, (4) the ease of calling an extraordinary shareholder's meeting, (5) the availability of mechanisms allowing minority shareholders to make legal claims against directors, or (6) shareholders have preemptive rights that can be waived only by a shareholder's vote. Panel B of Table 2 reports the value of the *ANTIDIR* for each of the 34 countries in our study and the United States as a benchmark. The coefficient on the variable *ANTIDIR* is expected to be positive because higher disclosure levels are expected for countries with stronger investor protection environments.

The variable for a country's financial system is denoted *STRUCTURE* and is defined as the log of the ratio of equity market capitalization to claims on the private sector by commercial banks. This variable is based on the work of Levine and Zervos (1998), Levine et al. (2000), and Beck and Levine (2002), and is measured using an average of macro-level country data for the period 1980–1989. A higher value indicates that a country's financial system relies relatively more on market-oriented equity financing, and relatively less on bank-based financing.[19] Panel B of Table 2 reports the value of the financial structure variable for each of the 34 countries in our study and the United States as a benchmark. The financial structure variable can have negative values because it is defined as the natural log of the ratio of equity market capitalization to private sector bank claims. The coefficient on *STRUCTURE* is expected to be positive because higher disclosure levels are expected in countries with more market-oriented financial systems.

---

[18] As a sensitivity analysis, alternative measures are used to proxy for country's legal environment with respect to investor protection. Specifically, we used an indicator variable that takes on the value of 1 for countries with a common law tradition, and 0 otherwise. La Porta et al. (1998) document that common law countries have stronger investor protection than civil law countries. We also used indicator variables for each of the three groups of civil law countries (French, German, and Scandinavian), with common law countries as the reference group. Untabulated results are robust to the inclusion of alternative proxies for a country's legal system.

Empirical Results of the Disclosure Incentive Tests

Panel A of Table 3 reports descriptive statistics for the variables in the analysis. The median values of *DISC_RAW* and *DISC_SCALED* are 20 and 0.57, respectively. There is considerable variation in the disclosure metrics, as represented by their standard deviation. The table also reveals that the sample consists primarily of larger firms with median assets of about $3 billion. However, there is wide range of variation within the sample. Firm-year observations are evenly distributed over the two years, as indicated by the mean value of 0.49 for the *YR* variable. The mean debt-to-asset ratio is 0.48. Thirty-nine percent of the firm-year observations are cross-listed in a foreign exchange. Also, note that the mean and median value for the country-level institutional variables, *ANTIDIR* and *STRUCTURE*, differ between Table 2 and 3 because our sample consists of an unequal number of observations from each country.

Panel B of Table 3 presents correlations between pairs of key variables. As one would expect, the two disclosure score metrics, *DISC_RAW* and *DISC_SCALED*, are positively correlated (0.58). However, the correlations are considerably less than 1, suggesting that the two metrics capture voluntary disclosures differently. In addition, *DISC_RAW* and *DISC_SCALED* exhibit correlations of the same sign (but different magnitudes) with the control variables.

As expected, country-level institutional characteristics, *ANTIDIR* and *STRUCTURE*, are positively correlated with each other (0.39). Overall the correlations among the firm-specific control variables are relatively low, ranging from 0.02 to 0.32, as are the correlations between *EXTDEP* and firm-specific control variables, and between firm-specific and country-level control variables, suggesting that multicollinearity is not likely to be a significant issue in the regression estimations.

The correlations between our disclosure metrics (*DISC_RAW* and *DISC_SCALED*) and the industry's external dependence (*EXTDEP*) are positive and statistically significant at $p < .05$, indicating that higher disclosure levels exist for firms in industries with greater external financing needs. This univariate result is consistent with H1 that disclosure is increasing in external financing needs.

Table 4 reports six regression models to formally test H1, which predicts that firms in industries with higher external financing needs have higher voluntary disclosure levels, after

---

[19] As a sensitivity and robustness check we test three other measures in Beck and Levine (2000) and these three variables yield comparable results to *STRUCTURE*. The first alternative measure of financial structure variable (*Structure-Activity*) is defined as the log of total value of share trading divided by claims on the private sector by commercial banks. A second alternative variable (*Structure-Aggregate*) is the first principal component of the two variables *Structure-Activity* and *Structure* using principal component analysis. A third measure of financial structure is *Structure-Dummy* and takes on a value of 1 if *Structure-Aggregate* is above the median, and 0 otherwise.

TABLE 3
Descriptive Statistics and Correlations

Panel A: Descriptive Statistics

Variable	n	Mean	Median	Std.	First Quartile	Third Quartile
DISC_RAW	672	20.44	20	10.29	14	27
DISC_SCALED	672	0.58	0.57	0.36	0.37	0.77
YR	672	0.49	0	0.50	0	1
EXTDEP	672	0.40	0.33	0.35	0.21	0.45
ASSETS (U.S.$ in millions)	672	33,430.67	3,372.54	338,716	1,105.43	9,304.10
LEV	672	0.48	0.51	0.27	0.24	0.69
CROSS_LIST	672	0.39	0	0.48	0	1
ANTIDIR	672	3.46	4	1.37	3	5
STRUCTURE	672	−1.72	−1.60	0.98	−2.44	−0.77

Panel B: Pearson Correlations

Variable	*EXTDEP*	*LASSET*	*LEV*	*CROSS_LIST*	*ANTIDIR*	*STRUCTURE*	*DISC_RAW*
LASSET	0.09**						
LEV	0.02	0.21***					
CROSS_LIST	0.12***	0.32***	0.07*				
ANTIDIR	−0.03	0.04	−0.01	0.12***			
STRUCTURE	0.11***	0.36***	0.09**	0.24***	0.39***		
DISC_RAW	0.09**	0.25***	0.15***	0.28***	0.19***	0.18***	
DISC_SCALED	0.09**	0.15***	0.12***	0.10***	0.20***	0.24***	0.58***

(continued on next page)

TABLE 3 (Continued)

---

*, **, *** Significant at 0.10, 0.05, and 0.01, respectively.

Variable Definitions:

DISC_RAW = CIFAR disclosure score – Country minimum CIFAR Disclosure Score;
DISC_SCALED = (CIFAR disclosure score – Country minimum CIFAR Disclosure Score)/Country minimum CIFAR Disclosure Score, or equivalently CIFAR disclosure score/Country minimum CIFAR Disclosure Score – 1;
YR = 1 if disclosure data is for 1993, 0 otherwise for 1991 data;
EXTDEP = average ratio of capital expenditures financed by external funds for U.S. firms in the same industry between 1980–1989. Source: Rajan and Zingales (1998);
LASSET = natural log of total assets;
LEV = short- and long-term debt to total assets;
CROSS_LIST = 1 if a firm is cross-listed in a foreign exchange, and 0 otherwise;
ANTIDIR = an index based on six specific elements of investor protection dealing with ability of outsider investors to challenge the control of the firm by inside owners and directors. Source: La Porta et al. (1998): and
STRUCTURE = log of (ratio of stock market capitalization to claims on private sector by commercial banks). Source: Beck and Levine (2000).

TABLE 4

Regression Results: Effect of External Financing Dependence on Disclosure

		Parameter Estimates (t-statistics in parenthesis)					
		Dependent Variable					
		DISC_RAW			*DISC_SCALED*		
Variable	Predicted Sign	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	?	3.178	1.1424	6.481	0.069	0.281	0.019
		(1.23)	(0.28)	(0.98)	(0.82)	(2.26)**	(0.14)
YR	?	0.467	0.831	0.668	0.085	0.077	0.091
		(0.64)	(0.98)	(0.95)	(3.59)***	(3.03)***	(6.04)***
EXTDEP	+	1.904	1.541	0.958	0.048	0.033	0.036
		(2.24)**	(1.98)**	(1.34)*	(1.72)**	(1.69)**	(2.03)**
LASSET	+	1.064	1.527	0.567	0.028	0.068	0.021
		(5.07)***	(4.40)***	(2.16)**	(4.10)***	(6.49)***	(3.99)***
LEV	+	3.779	4.481	3.429	0.121	0.165	0.069
		(2.76)***	(2.62)***	(2.51)***	(2.70)***	(3.19)***	(2.39)***
CROSS_LIST	+	3.995	2.587	2.956	0.038	0.031	0.051
		(4.91)***	(2.87)***	(3.71)***	(1.44)*	(1.15)	(2.97)***
MB_RATIO	+		1.13			0.073	
			(3.39)***			(4.22)***	
ANTIDIR	+	1.138	1.201		0.047	0.073	
		(3.68)***	(3.20)***		(4.70)***	(4.17)***	
STRUCTURE	+	−0.359	−0.367		0.002	0.024	
		(−0.79)	(−0.62)		(0.12)	(1.32)*	
Country fixed effects		Excluded	Excluded	Included	Excluded	Excluded	Included
Adjusted R^2		0.15	0.13	0.29	0.13	0.14	0.28
n		672	485	672	672	485	672

(continued on next page)

TABLE 4 (Continued)

---

*, **, *** Significant at 0.10, 0.05, and 0.01 (all one-tailed except when sign is not predicted), respectively.

Variable Definitions:

DISC_RAW = CIFAR disclosure score – Country minimum CIFAR Disclosure Score;
DISC_SCALED = (CIFAR disclosure score – Country minimum CIFAR Disclosure Score)/Country minimum CIFAR Disclosure Score, or equivalently CIFAR disclosure score/Country minimum CIFAR Disclosure Score – 1;
YR = 1 if disclosure data is for 1993, 0 otherwise for 1991 data;
EXTDEP = average ratio of capital expenditures financed by external funds for U.S. firms in the same industry between 1980–1989. Source: Rajan and Zingales (1998);
LASSET = natural log of total assets;
LEV = short- and long-term debt to total assets;
CROSS_LIST = 1 if a firm is cross-listed in a foreign exchange, 0 otherwise;
MB_RATIO = market-to-book value of equity;
ANTIDIR = an index based on six specific elements of investor protection dealing with the ability of outsider investors to challenge the control of the firm by inside owners and directors. Source: La Porta et al. (1998); and
STRUCTURE = log of (ratio of stock market capitalization to claims on private sector by commercial banks). Source: Beck and Levine (2000).

controlling for other firm- and country-characteristics. The dependent variable in models (1) through (3) is *DISC_RAW*, while the dependent variable in models (4) through (6) is *DISC_SCALED*. Models (1) and (4) report the estimations of Equation (1) using *DISC_RAW* and *DISC_SCALED*, respectively, while the remaining models report alternative model specifications and sensitivity analyses.

The adjusted-R^2 of models (1) and (4) are 0.15 and 0.13, respectively. The test variable *EXTDEP* is positively associated with disclosure levels as predicted and is significant at $p < .05$ in both models, which indicates that higher disclosure occurs in both absolute and relative terms for firms in industries with a higher need for external financing, after controlling for other firm-specific and country-level factors that might affect disclosure levels. Other variables are generally significant in the expected direction. The coefficient on the *YR* variable is positive and statistically significant at the 0.01 level only in model (4), suggesting that the percentage increase in disclosure scores relative to country-level minimum score is higher in 1993. As predicted, the coefficients on firm-specific control variables *LASSET* and *LEV* (representing the size and leverage) are positive and statistically significant at $p < .01$ in both models. The coefficient on *CROSS_LIST* is also positive and statistically significant at $p < .10$ except in model (5). These results are consistent with the single-country studies that find disclosure to be positively related to firm size, leverage, and listing status. The coefficient on *ANTIDIR* is positive and statistically significant at $p < .01$ in both models, indicating that disclosures are higher as expected in countries with stronger investor protection. Unexpectedly, the coefficient on the country-level variable *STRUCTURE* is insignificant ($p > .10$).[20]

Models (2) and (5) in Table 4 are the same as models (1) and (4), respectively, except for the inclusion of the ratio of market to book value of equity (*MB_RATIO*) as an additional control variable. While the market-to-book ratio can proxy for several factors, recent research by Nagar et al. (2003) argues that firms with high market-to-book ratios have greater information asymmetry and therefore are expected to have higher disclosure levels. In our context, omission of the market-to-book ratio in Equation (1) can result in a potentially correlated omitted variable problem, if the market-to-book ratio serves as a surrogate for the investment opportunity set, and the associated financing considerations that might affect a firm's disclosure policy. Models (2) and (5) are estimated for a reduced sample 485 observations with available data to compute *MB_RATIO*, and we find a positive association between *MB_RATIO* and disclosure level. However, inclusion of *MB_RATIO* does not alter our inferences with respect to the primary test variable as *EXTDEP* continues to be positively associated with disclosure at $p < .05$.

Models (3) and (6) in Table 4 are the same models (1) and (4), respectively, except they are estimated using fixed effects for each country in lieu of the country-level variables *ANTIDIR* and *STRUCTURE* in models (1) and (4).[21] To simplify our presentation, the coefficients for country-fixed effects are not reported. After controlling for the fixed effects of country and time, the test variable *EXTDEP* is positive and significant at $p < .10$ in model (3) and at $p < .05$ in model (6). The remaining coefficients on firm-specific control variables have the expected signs and are statistically significant at $p < .01$.

---

[20] The simple correlation between *ANTIDIR* and *STRUCTURE* is 0.39, suggesting the two variables are capturing some underlying commonalities. When *ANTIDIR* is dropped from models (1) and (4), *STRUCTURE* becomes statistically significant ($p < .01$) in model (4). However, *STRUCTURE* is not statistically significant ($p > .10$) in model (1). In both cases, the test variable *EXTDEP* continues to be positively associated with disclosure at $p < .05$.

[21] A fixed-effect model assumes that a specific characteristic of a cross-sectional unit (e.g., firms in a country) is a parameter, while a random-effect model assumes that the specific characteristic of a cross-sectional unit is a normally distributed random variable. For our sample, a Hausman (1978) test indicates that a fixed-effect model specification is appropriate rather than a random-effect model.

In sum, all six models in Table 4 show a consistently significant positive association between firm-level disclosures and a firm's need for external financing based on the industry benchmark in Rajan and Zingales (1998). As a sensitivity analysis the models in Table 4 are re-estimated dropping each of the 18 industries in the sample one at a time, and re-estimated by excluding each of the 34 countries in the sample one at a time. In addition, we re-estimated all models in Table 4 after changing the negative value of *EXTDEP* in the tobacco industry to zero. The results in Table 4 are robust to all of these sensitivity analyses, which indicate that the tests are not driven by individual industries or individual countries. Overall these results are consistent with a firm's external financing dependence creating an incentive for firm-level voluntary disclosures around the world, over and above the disclosure effects associated with country-specific legal and financial systems.

Interaction Tests

As indicated earlier, the model estimations reported in Table 4 treat the test variable *EXTDEP* as independent of the country-level variables *ANTIDIR* and *STRUCTURE*. However, it is possible that the disclosure effects are conditional on a country's legal and financial systems. Specifically, the disclosure incentives could operate only in countries with stronger investor protection environments and more developed financial markets. If this were the case, there would be a positive and significant interaction between *EXTDEP* and *ANTIDIR*, and between *EXTDEP* and *STRUCTURE*. We test if these interactions are significant by adding each interaction term, one at a time, and jointly, to the six models in Table 4. In no cases are the interaction terms significant ($p > .10$). As an alternative specification, we replace *ANTIDIR* and *STRUCTURE* with indicator variables coded 1 for those firms above the median values and 0 otherwise, and interact these alternative variable specifications with *EXTDEP*. Again, none of the interaction terms is significant ($p > .10$). These interaction tests are important because they indicate that the effect of a firm's external financing needs (*EXTDEP*) on voluntary disclosure incentives is *not* conditional on the country's legal and financial system. In some respects this is a surprising result, but at face value it indicates that firm-level voluntary disclosure incentives are important globally and operate independently of country-specific factors.

V. DISCLOSURE AND COST OF CAPITAL

The tests reported so far indicate a positive association between voluntary disclosure levels and the firm's need for external financing. In this section, we describe the empirical models, variables, and results of the tests of the second hypothesis that predicts a lower cost of debt and equity capital for firms with higher disclosure levels to have.[22]

Empirical Models

Given the paucity of empirical research linking disclosure levels to the cost of capital in an international setting, we rely on prior research using U.S. data to examine the determinants of the cost of capital.[23] Typically, these studies explain the cost of capital in terms of issuer characteristics (default and equity risk), issue characteristics (such as size of debt issue, voting rights attached to the security), and macroeconomic conditions (market interest rates, stage of the economic cycle). Based on our survey of prior research, the impact of disclosure on a firm's cost of debt and equity capital is examined using the following regression models:[24]

---

[22] Following prior research by Botosan (1997) and Sengupta (1998), we separately model the cost of debt and the cost of equity without considering the simultaneity between the two sources of raising external capital.

[23] A notable exception is Hail and Leuz (2003), who focus on the cost of equity capital using country-level data.

$$COD = f(DISC, YR, LEV, ROA, LASSET, BANK\_RATE, ANTIDIR, STRUCTURE) \quad (2)$$

$$COE = f(DISC, YR, LEV, ROA, LASSET, VAR, INFLATION, ANTIDIR, STRUCTURE) \quad (3)$$

where:

COD = the cost of debt capital;
COE = the cost of equity capital;
$DISC$ = a metric that captures the total disclosure score over and above the country-level minimum score for a firm i in industry j in country k;
ROA = the return on assets measured as net income divided by total assets;
$BANK\_RATE$ = the country-specific bank rate that applies to the short- and medium-term financing needs of the private sector;
VAR = earnings variability measured by the dispersion in analysts' forecasts of earnings; and
$INFLATION$ = the consumer price index reflecting changes in the cost of acquiring a fixed basket of goods and services by the average consumer.

All other variables (*LEV, LASSET, ANTIDIR*, and *STRUCTURE*) are defined as in Equation (1).

In Equations (2) and (3), both *DISC_RAW* and *DISC_SCALED* are individually tested as alternative independent variables. Estimation of Equations (2) and (3) using ordinary least squares can yield biased and inconsistent parameter estimates if the error term and our disclosure proxies (*DISC_RAW* and *DISC_SCALED*) are correlated. As noted previously, a firm's disclosure decision results from its desire to obtain lower cost external financing. However, a firm's ability to obtain lower cost external financing also results from its choice of disclosure policy. Both of these cause-and-effect relations are feasible, suggesting that disclosure and cost of capital are likely to be jointly determined. Therefore, as additional sensitivity analysis, we use two-stage least squares (2SLS) estimation, using the set of variables listed in the disclosure Equation (1) as instruments to obtain the fitted values of our disclosure proxies. The advantage of the 2SLS estimation is that it yields consistent parameter estimates because fitted values of our disclosure proxies are uncorrelated with the error term in our cost of capital equations.

The models in Equations (2) and (3) also control for the year of the observation (variable *YR*) because the cost of capital can vary over time. Firm-specific control variables in the two equations capture default and equity risk because prior research (for example, Bowman 1979; Galai and Masulis 1976; Hamada 1972; among others) indicates that equity risk and default risk are positively correlated and that the higher the default and equity risk, the higher the cost of capital. Specifically, we use financial leverage (*LEV*), return on assets (*ROA*), firm size (*LASSET*), and earnings variability (*VAR*) as proxies for default and equity risk.[25] Finally, we include country-specific variables *BANK_RATE* and *INFLATION* to control for macro-economic conditions, and *ANTIDIR* and *STRUCTURE* to control for country-level institutional effects on cost of capital.[26]

---

[24] For ease of exposition, we ignore firm, industry, and country subscripts in the equations.

Dependent Variable—Cost of Debt Capital

Cost of debt capital is the interest rate on the firm's debt, which is calculated as interest expense for the year divided by average short- and long-term debt during the year.[27] This estimate of the cost of debt capital is a historic pre-tax interest rate based on cumulative debt financing decisions of each sample firm.[28] Missing interest expense data on Global Vantage and International Moody's manuals yield a reduced sample of 414 firm-year observations from 29 countries.[29]

Dependent Variable—Cost of Equity Capital

Cost of equity capital is an *ex ante* metric. It is a measure of *expected* rather than realized returns and thus is not directly observable.[30] Prior literature suggests several alternative approaches for calculating the *ex ante* cost of equity capital metric (Claus and Thomas 2001; Gebhardt et al. 2001; Ohlson and Juettner-Nauroth [OJ] 2000, as implemented by Gode and Mohanram [2003] and Easton [2004]). The basic idea in all these approaches is to use price and analysts' earnings forecasts in the valuation equation, and to derive the *ex ante* cost of equity capital as the internal rate of return that equates the current stock price and the sequence of expected (abnormal) earnings derived from analysts' forecasts. While recent research (e.g., Botosan and Plumlee 2005; Easton and Monahan 2005) using U.S. data report mixed evidence on how alternative approaches of *ex ante* cost of equity capital correlate with risk measures, recent research by Hail and Leuz (2003) using international data indicates that estimates of the *ex ante* cost of equity capital obtained from these approaches are fairly similar, within reasonable ranges, and are positively correlated.[31]

We utilize the methodology in Easton (2004) to estimate the firm-specific *ex ante* cost of equity capital because it has less onerous data requirements, and only requires data on price and earnings growth to calculate the cost of equity capital. Under this approach, firm-specific *ex ante* cost of equity capital is defined as the square root of the inverse of the price-earnings growth ratio:

---

[25] As indicated in the text below, computation of VAR requires coverage of sample firms on I/B/E/S, thereby reducing the sample size dramatically. Because the I/B/E/S constraint is (not) necessary for computing cost of equity (debt) capital, we include VAR as a control variable only in Equation (3).

[26] Ideally, it would be desirable to control for the real risk-free rates in each country. However, such rates are not readily available (Hail and Leuz 2003). Therefore, we use nominal rates in Equation (2) and inflation rates in Equation (3).

[27] Differing international reporting rules can affect the measurement of the cost-of-debt variable. For example, some of our sample firms net interest expense against interest income. In addition, we do not include the amount of interest capitalized in our calculation of the cost of debt. Therefore, there is measurement error in our calculation of the cost-of-debt variable.

[28] We do not adjust the cost of debt by the country-specific tax rates because theory predicts a relation between disclosure and cost of financing, independent of the prevailing tax structure.

[29] The five countries omitted from this analysis are Austria, Brazil, Nigeria, Pakistan, and Turkey.

[30] Claus and Thomas (2001) identify several limitations of relying on realized returns as a proxy for expected returns.

[31] Hail and Leuz (2003) report that simple average *ex ante* cost of capital estimates based on the estimates derived under these approaches correlate with risk measures in a consistent and theoretically expected direction. Hail and Leuz (2003) also note that to the extent that *ex ante* cost of capital estimates rely on analyst forecasts, international differences in forecasting behavior could mechanically affect cost of equity capital cross-country regression results. Following Hail and Leuz (2003), we compute forecast bias as the mean one-year ahead consensus forecast minus the actual earnings reported in I/B/E/S and include it as a control variable in our cost of equity capital regression models. Similar to Hail and Leuz's (2003) finding, the forecast bias variable is never statistically significant ($p > .10$) in any of our model specifications. Therefore, we present cost of capital regression results without including forecast bias as a control variable.

$$r_{PEG} = \sqrt{\frac{eps_2 - eps_1}{P_0}}$$

where:

r_{PEG} = *ex ante* cost of equity capital, where *PEG* refers to price-earnings growth model;[32]
eps_1 = the one-year ahead mean analysts' earnings forecast per share;
eps_2 = the two-year ahead mean analysts' earnings forecast per share; and
P_0 = the price per share at fiscal year-end.

As an example, for a firm-year observation with fiscal year ending on December 31, 1991, we use as eps_1 and eps_2 the earnings forecasts available on I/B/E/S as of December 1991 for fiscal years ending December 31, 1992 and 1993, respectively. In this example, P_0 is the common stock price as of December 31, 1991. To compute *ex ante* cost of equity capital, our sample firms must have the one-year ahead and two-year ahead consensus (mean) analysts' earnings forecasts or the one year-ahead consensus (mean) analysts' earnings forecast and a forecast of growth in earnings for the subsequent year on I/B/E/S, the current stock price as of the fiscal-year end, and the necessary data for other explanatory variables included in our regression model.[33] These additional data constraints yield a reduced sample of 274 firm-year observations from 23 countries.[34]

Firm-Specific Control Variables

As noted previously, firm-specific variables are included in Equations (2) and (3) to control for default and equity risk. The higher the financial leverage, the higher the probability that the firm could default; hence, the coefficient on the variable *LEV* is expected to be positive. By contrast, the higher the return on assets (*ROA*), the lower the default risk. Hence, the coefficient on the variable *ROA* is expected to be negative.

We include firm size as an additional control because firm size is inversely related to equity risk. Recent empirical research (e.g., Botosan 1997; Botosan and Plumlee 2002; Gode and Mohanram 2003) documents a negative association between firm size and *ex ante* cost of equity capital. Consequently, the coefficient on the variable *LASSET* is expected to be negative. Prior research also indicates that higher values of beta (systematic risk) imply higher equity risk. However, because of data constraints, we are unable to compute beta for many of our sample firms. Instead, we use earnings variability as an alternative proxy for risk in firm valuation. The variability in earnings can also be perceived as a source of risk for firm valuation, and Gebhardt et al. (2001) document that earnings variability is positively correlated with beta. We use the dispersion in analysts' forecasts of earnings as a proxy for earnings variability (*VAR*). Since higher values of *VAR* imply higher risk, the coefficient on the variable *VAR* is expected to be positive.

---

[32] Ohlson and Juettner-Nauroth (2000) show that the use of price-earnings growth model to compute expected cost of equity capital is a special case of the residual income valuation model and it assumes abnormal earnings persist in perpetuity.

[33] The Easton (2004) methodology also requires that the two-year-ahead consensus earnings forecast exceed the one-year-ahead forecast. Also, firm years with negative forecasts of earnings are eliminated from cost of capital tests.

[34] The 11 countries omitted from this analysis are Brazil, Chile, Columbia, Greece, India, Israel, Mexico, Nigeria, Philippines, Sri Lanka, and Zimbabwe.

Country-Level Control Variables

As noted previously, *BANK_RATE* is the country-specific bank rate that applies to short- and medium-term financing in the private sector. This rate can be viewed as providing a benchmark interest rate relative to which all other borrowers pay a default risk premium. The higher the benchmark rate, the higher the cost of borrowing (Fabozzi 1997). Consequently, in Equation (2), the coefficient on *BANK_RATE* is expected to be positive.

Hail and Leuz (2003) note that the *ex ante* cost of capital estimates reflect countries' expected inflation rates because these estimates are derived from analyst forecasts expressed in nominal terms and local currency. Therefore, they expect a positive relation between the inflation proxy and the cost of equity capital estimate. Consistent with Hail and Leuz (2003), we proxy expected future inflation by using the median of the next years' monthly inflation rates (*INFLATION*) and include it as a control variable in Equation (3) with an expected positive coefficient.

We also include *ANTIDIR* and *STRUCTURE* as additional country-level control variables in Equations (2) and (3). La Porta et al. (2002) document that individual firms are valued more highly in countries with strong investor protection laws (*ANTIDIR*). A potential explanation for this result is that greater legal protection against expropriation by insiders reduces investment risk and leads to higher valuation. Consequently, in Equations (2) and (3), the coefficient on *ANTIDIR* is expected to be negative.[35] Beck and Levine (2002) argue that market-based systems (*STRUCTURE*) facilitate diversification and the customization of risk management devices. To the extent that this is the case, we expect the coefficients on *STRUCTURE* to be negative in Equations (2) and (3).

Empirical Results for Cost of Debt Capital

Panel A of Table 5 presents summary statistics for the variables employed in estimating Equation (2). The mean values of *DISC_RAW* and *DISC_SCALED* are 22.25 and 0.62, respectively. The mean cost of debt capital for our sample is 11.3 percent and the mean bank lending rate is 10.86 percent. While firms in the reduced sample are larger, otherwise they exhibit similar characteristics to firms in the full sample used for testing H1.

Panel B of Table 5 reports Pearson correlations between pairs of key variables. Again, many firm- and country-specific variables exhibit correlation patterns similar to those reported for the sample used for testing H1. *BANK_RATE* is negatively correlated with *ANTIDIR* and *STRUCTURE*, suggesting that *BANK_RATE* could reflect country-level institutional characteristics. Of particular interest are the correlations between the cost of debt and various firm- and country-level characteristics including *DISC_RAW* and *DISC_SCALED* reported in the bottom row of Panel B. Except for *ROA*, the cost of debt displays the predicted correlations with all control variables included in Equation (2). The correlation between cost of debt and *DISC_RAW* and between cost of debt and *DISC_SCALED* is -0.17 and -0.21, respectively, and both correlations are statistically significant at $p < .01$. This univariate test is consistent with H2 that the cost of debt capital decreases with the level of disclosure, but of course it does not control for other effects.

---

[35] In the cost of debt capital regressions, as a sensitivity analysis we substituted *ANTIDIR* with the creditor right index formed by La Porta et al. (1998) by aggregating different creditor rights. Our results with using this alternative specification are qualitatively similar to those reported in the paper.

TABLE 5
Descriptive Statistics (Cost of Debt Sample)

Panel A: Descriptive Statistics

Variable	n	Mean	Median	Std.	First Quartile	Third Quartile
Cost of debt	414	0.113	0.095	0.091	0.064	0.121
YR	414	0.52	1.00	0.50	0.00	1.00
LEV	414	0.50	0.53	0.27	0.28	0.71
ROA	414	0.02	0.02	0.05	0.01	0.05
ASSETS (U.S.$ in millions)	414	46387.88	4227.29	4277.84	1831.61	10684.17
BANK_RATE	414	10.86	10.22	5.85	7.53	12.46
ANTIDIR	414	3.61	4.00	1.33	3.00	5.00
STRUCTURE	414	−1.73	−1.35	1.00	−2.71	−0.77
DISC_RAW	414	22.25	21.00	9.98	16.00	30.00
DISC_SCALED	414	0.62	0.65	0.23	0.43	0.80

Panel B: Pearson Correlations

Variable	*LEV*	*ROA*	*LASSET*	*BANK_RATE*	*ANTIDIR*	*STRUCTURE*	*DISC_RAW*	*DISC_SCALED*
ROA	−0.19***							
LASSET	0.16***	−0.15***						
BANK_RATE	−0.25***	0.11***	−0.44***					
ANTIDIR	0.04	0.22***	0.13	−0.25***				
STRUCTURE	0.15***	−0.03	0.43***	−0.57***	0.45***			
DISC_RAW	0.09*	−0.02	0.24***	−0.26***	0.21***	0.12***		
DISC_SCALED	0.21***	−0.02	0.35***	−0.39***	0.37***	0.24***	0.66***	
Cost of debt	0.08*	−0.02	−0.25***	0.23***	−0.09***	−0.11***	−0.17***	−0.21***

(*continued on next page*)

TABLE 5 (Continued)

, * Significant at 0.10, 0.05, and 0.01, respectively.

Variable Definitions:

Cost of debt = interest expense for the year divided by average short- and long-term debt;
YR = 1 if disclosure data is for 1993, 0 otherwise for 1991 data;
LEV = short- and long-term debt to total assets;
ROA = return on assets;
LASSET = natural log of total assets;
BANK_RATE = bank rate that applies to the short- and medium-term financing needs of the private sector. Source: IMF (2003);
ANTIDIR = an index based on six specific elements of investor protection dealing with the ability of outsider investors to challenge the control of the firm by inside owners and directors. Source: La Porta et al. (1998);
STRUCTURE = log of (ratio of stock market capitalization to claims on private sector by commercial banks). Source: Beck and Levine (2000);
DISC_RAW = CIFAR disclosure score − Country minimum CIFAR Disclosure Score; and
DISC_SCALED = (CIFAR disclosure score − Country minimum CIFAR Disclosure Score)/Country minimum CIFAR Disclosure Score, or equivalently CIFAR disclosure score/Country minimum CIFAR Disclosure Score − 1.

Table 6 presents the results of estimating alternative specifications of Equation (2) to examine whether disclosure affects the cost of debt after controlling for other firm- and country-specific factors that affect the cost of capital. The first four models present ordinary least squares (OLS) results of Equation (2). To examine the sensitivity of our results to the choice of estimation, the last two models in Table 6 report two-stage least squares (2SLS) results where we first use the set of variables listed in the disclosure Equation (1) as instruments to obtain the fitted values of our disclosure proxies, and then use the fitted values of our disclosure proxies in estimating the cost of debt Equation (2).

Models (2) and (4) use country-level fixed effects in lieu of the country-level variables, *ANTIDIR* and *STRUCTURE*, and have higher explanatory power as reflected by the adjusted R^2s of the models.[36] Comparison of the 2SLS results to the OLS results indicates little difference in the coefficient estimates. In all models, the control variables, firm size (*LASSET*) and *BANK_RATE*, are associated with the cost of debt in the expected direction. The variable, leverage (*LEV*), is marginally significant ($p < .10$) in the 2SLS estimations. The coefficients on *ANTIDIR* and *STRUCTURE* are not statistically significant ($p > .10$) except in model (5).[37] Thus, in our sample the cost of debt capital is unaffected by cross-country differences in investor protection and the degree to which a country's financial system is equity- versus bank-based.

Our main interest is whether the disclosure variables are negatively associated with the cost of debt as predicted in H2. Both the OLS and the 2SLS results in Table 6 are consistent with this prediction. Specifically, for all six models the coefficients on the disclosure variables are negative and statistically significant at $p < .05$. These results indicate that the cost of debt decreases with higher voluntary disclosure levels, after controlling for other firm- and country-specific factors. The coefficient on *DISC_RAW* is -0.001 in model (1), which means that for a one-point change in the disclosure score, the cost of debt capital decreases by 1/10th of 1 percent, or 10 basis points. Alternatively, our results indicate that for a one standard deviation increase in *DISC_RAW* (9.98), the cost of debt capital decreases by nearly 1 percent (0.001×9.98). Thus, *DISC_RAW* appears to be both statistically and economically significant.

Empirical Results for Cost of Equity Capital

Panel A of Table 7 provides summary descriptive statistics for the variables employed in the estimation of Equation (3). The mean values of *DISC_RAW* and *DISC_SCALED* are 22 and 0.61, respectively. The mean *ex ante* cost of equity capital for our sample is 11.7 percent. Other firm characteristics are as follows: the firms in the sample have a mean debt to asset ratio of 0.49, the mean return on assets (*ROA*) is 4 percent, and the median size of the firms in the sample as measured by total assets is U.S. $3,887.3 million. In addition, the median value of the variability of earnings as measured by dispersion of analysts' forecasts is 0.05. In terms of country-level variables, the average inflation rate (*INFLATION*) is 3.49 percent, the mean value for *ANTIDIR* is 3.68, and the mean value for *STRUCTURE* is -1.50.

Panel B of Table 7 presents correlations among key variables. Many firm- and country-specific variables exhibit correlation patterns similar to those reported earlier for the cost of debt sample. The correlation between cost of equity capital and explanatory variables in

---

[36] Country-fixed effects capture observed and unobserved heterogeneity in the cost of capital. For our sample, a Hausman (1978) test indicates that a fixed-effect model is appropriate rather than a random-effect model.

[37] The highest variance inflation factor (VIF) for the variables, *STRUCTURE* and *ANTIDIR*, in models (1) and (3) was only 1.48. Hence, the lack of significance of variable *STRUCTURE* cannot be attributed to collinearity.

TABLE 6
Regression Results: Effect of Voluntary Disclosure on Cost of Debt Capital
Dependent Variable is Cost of Debt

		Parameter Estimates (t-statistics in parenthesis)					
		Ordinary Least Squares				Two-Stage Least Squares[a]	
Variable	Predicted Sign	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	?	0.178 (4.88)***	0.018 (0.16)	0.171 (4.67)***	0.016 (0.29)	0.198 (5.67)***	0.156 (4.40)***
YR	?	0.019 (2.11)**	0.033 (2.43)***	0.021 (2.15)**	0.031 (2.24)**	0.022 (2.18)**	0.032 (2.60)***
LEV	+	0.015 (0.91)	0.002 (0.08)	0.017 (1.33)*	0.002 (0.11)	0.026 (1.28)*	0.018 (1.55)*
ROA	–	0.003 (1.09)	0.132 (1.11)	0.105 (1.00)	0.145 (1.08)	0.003 (0.57)	0.098 (0.75)
LASSET	–	−0.008 (−3.01)***	−0.012 (−3.78)***	−0.008 (−3.07)***	−0.012 (−3.89)***	−0.005 (−1.81)**	−0.003 (−2.12)**
BANK_RATE	+	0.002 (2.57)***	0.006 (1.99)**	0.002 (1.68)**	0.005 (1.58)*	0.002 (2.54)***	0.002 (2.68)***
ANTIDIR	–	0.001 (0.12)		0.001 (0.04)		−0.006 (−1.76)**	0.004 (0.53)
STRUCTURE	–	0.008 (1.16)		0.007 (1.14)		0.008 (1.17)	0.003 (0.21)
DISC_RAW	–	−0.001 (−2.45)***	−0.001 (−2.36)***			−0.002 (−1.70)**	
DISC_SCALED	–			−0.021 (−2.12)**	−0.044 (−2.37)***		−0.026 (−1.97)**
Country fixed effects		Excluded	Included	Excluded	Included	Excluded	Excluded
Adjusted R^2		0.09	0.19	0.11	0.18	0.08	0.09
n		414	414	414	414	414	414

(*continued on next page*)

TABLE 6 (Continued)

---

*, **, *** Significant at 0.10, 0.05, and 0.01 (all one-tailed except when the sign is not predicted), respectively.

[a] In the two-stage least squares estimations, *DISC_RAW* and *DISC_SCALED* are the fitted values obtained by using the set of variables (*EXTDEP*, *YR*, *LASSET*, *LEV*, *CROSS_LIST*, *ANTIDIR*, and *STRUCTURE*) in disclosure Equation (1) as instruments.

Variable Definitions:

Cost of debt = interest expense for the year divided by average short- and long-term debt;
YR = 1 if disclosure data is for 1993, 0 otherwise for 1991 data;
LEV = short- and long-term debt to total assets;
ROA = return on assets;
LASSET = natural log of total assets;
EXTDEP = average ratio of capital expenditures financed by external funds for U.S. firms in the same industry between 1980–1989. Source: Rajan and Zingales (1998);
CROSS_LIST = 1 if a firm is cross-listed in a foreign exchange, 0 otherwise;
BANK_RATE = bank rate that applies to the short- and medium-term financing needs of the private sector. Source: IMF (2003);
ANTIDIR = an index based on six specific elements of investor protection dealing with the ability of outsider investors to challenge the control of the firm by inside owners and directors. Source: La Porta et al. (1998);
STRUCTURE = log of (ratio of stock market capitalization to claims on private sector by commercial banks). Source: Beck and Levine (2000);
DISC_RAW = CIFAR disclosure score − Country minimum CIFAR Disclosure Score; and
DISC_SCALED = (CIFAR disclosure score − Country minimum CIFAR Disclosure Score)/Country minimum CIFAR Disclosure Score, or equivalently CIFAR disclosure score/Country minimum CIFAR Disclosure Score − 1.

TABLE 7
Descriptive Statistics (Cost of Equity Sample)

Panel A: Descriptive Statistics

Variable	n	Mean	Median	Std.	First Quartile	Third Quartile
Cost of equity	274	0.117	0.098	0.068	0.076	0.132
YR	274	0.53	1.00	0.50	0.00	1.00
LEV	274	0.49	0.54	0.24	0.25	0.68
ROA	274	0.04	0.04	0.05	0.02	0.06
ASSETS (U.S.$ in millions)	274	9467.19	3887.27	14578	1669.56	9602.12
VAR	274	0.21	0.05	0.33	0.01	0.16
INFLATION	274	3.49	3.22	4.28	1.69	4.44
ANTIDIR	274	3.68	4.00	1.34	3.00	5.00
STRUCTURE	274	−1.50	−1.27	0.80	−1.68	−0.77
DISC_RAW	274	22.00	16.00	9.36	0.42	0.76
DISC_SCALED	274	0.61	0.64	0.21	0.39	0.80

Panel B: Pearson Correlations

Variable	*LEV*	*ROA*	*LASSET*	*VAR*	*INFLATION*	*ANTIDIR*	*STRUCTURE*	*DISC_ RAW*	*DISC_ SCALED*
ROA	−0.21***								
LASSET	0.19***	−0.25***							
VAR	−0.01	−0.15***	−0.01						
INFLATION	−0.08***	0.24***	−0.35***	−0.03					
ANTIDIR	−0.19	0.11***	0.13***	−0.38***	−0.01				
STRUCTURE	−0.06	−0.03	0.43***	−0.36***	−0.24***	0.50***			
DISC_RAW	0.19**	−0.13**	0.32***	−0.02	−0.03	0.05*	0.08		
DISC_SCALED	0.27***	−0.11***	0.24***	−0.03	−0.21***	0.10*	0.18***	0.66***	
Cost of equity	0.06*	−0.11*	−0.16***	0.05	0.43***	−0.23***	−0.32***	−0.07**	−0.22***

(continued on next page)

TABLE 7 (Continued)

---

*, **, *** Significant at 0.10, 0.05, and 0.01 (all one-tailed except when sign is not predicted), respectively.

Variable Definitions:

Cost of equity = the *ex ante* cost of equity capital using the price-earnings growth (PEG) ratio (Easton 2004);
YR = 1 if disclosure data is for 1993, 0 otherwise for 1991 data;
LASSET = natural log of total assets;
ROA = return on assets;
LEV = short- and long-term debt to total assets;
VAR = variability of earnings as measured by the dispersion of analysts forecasts;
INFLATION = consumer price index reflecting changes in the cost of acquiring a fixed basket of goods and services by the average consumer. Source: IMF (2003);
ANTIDIR = an index based on six specific elements of investor protection dealing with ability of outsider investors to challenge the control of the firm by inside owners and directors. Source: La Porta et al. (1998);
STRUCTURE = log of (ratio of stock market capitalization to claims on private sector by commercial banks). Source: Beck and Levine (2000);
DISC_RAW = CIFAR disclosure score − Country minimum CIFAR Disclosure Score; and
DISC_SCALED = (CIFAR disclosure score − Country minimum CIFAR Disclosure Score)/Country minimum CIFAR Disclosure Score, or equivalently CIFAR disclosure score/Country minimum CIFAR Disclosure Score − 1.

Equation (3) are especially noteworthy. Except for *VAR*, each of these correlations is in the predicted direction. Also, there appears to be a stronger association between cost of equity capital and *DISC_SCALED* than between cost of equity capital and *DISC_RAW* (as represented by a larger absolute value of the correlations), although both correlations are statistically significant at $p < .05$.

Table 8 presents the regression results where the dependent variable is the *ex ante* cost of equity capital (r_{PEG}). The models reported in Table 8 differ in estimation methods and in the test and control variables used in the regression models. The first four models present ordinary least squares (OLS) results of Equation (2). In contrast to models (1) and (3), models (2) and (4) use a fixed effect for each country in lieu of the country-level variables *ANTIDIR* and *STRUCTURE*.[38] To examine the sensitivity of our results to the choice of estimation, the last two models in Table 8 report two-stage least squares (2SLS) results where we first use the set of variables listed in the disclosure Equation (1) as instruments to obtain the fitted values of our disclosure proxies, and then use the fitted values of our disclosure proxies in estimating the cost of equity Equation (3).

In the regression models, the *YR* dummy variable controls for structural shifts in the intercept and is not statistically significant ($p > .10$).[39] Among the firm-specific control variables, only return on assets (*ROA*) is consistently significant at $p < .01$. The coefficient on *INFLATION* is positive as expected and statistically significant at $p < .05$ in all models except model (2). The coefficients on *ANTIDIR* are negative and statistically significant at $p < .10$ in all estimations, and the coefficients on *STRUCTURE* are negative and statistically significant at $p < .05$ using OLS but insignificant using 2SLS. Overall these results are consistent with the cost of equity capital being consistently lower in countries with stronger investor protection, but are less conclusive with respect to financing systems.

In terms of our second hypothesis, our main interest is whether the disclosure metrics are negatively associated with *ex ante* cost of equity capital. The coefficients on the test variables *DISC_RAW* and *DISC_SCALED* are negative and statistically significant at $p < .10$ in all models, as expected, indicating a higher level of disclosure is associated with a lower cost of equity capital. *DISC_RAW* is significant at $p < .10$ in two models, and $p < .05$ in one model. *DISC_SCALED* is significant at $p < .01$ in one model, $p < .05$ in one model, and $p < .10$ in one model. Overall, the results in Table 8 provide evidence of a negative association between cost of equity capital and disclosure levels, after controlling for other firm-specific and country-level factors, although the statistical significance levels are not as consistently low as the debt tests in Table 6.

VI. DISCUSSION AND CONCLUSION

We comprehensively examine both disclosure incentives and disclosure consequences on cost of capital for a set of 672 observations from 34 countries outside of the United States where alternative legal and financial systems could mitigate the effectiveness of voluntary disclosures. Extant theory on voluntary disclosure posits that an expanded disclosure policy is a mechanism that serves to reduce the information asymmetry between inside managers and outside investors. Two implications flow from this line of inquiry. First, firms that depend on external financing are likely to undertake an expanded disclosure policy. Second, a higher disclosure level will lead to a lower cost of external financing.

---

[38] Again, the Hausman (1978) test indicates that a fixed-effect model specification is appropriate rather than a random-effect model.

[39] We also estimated the models by substituting *YR* with *BANK_RATE* to control for interest rate changes, and the inferences with respect to our test variable are comparable to those reported in the paper.

TABLE 8
Regression Results: Effects of Voluntary Disclosure on Cost of Equity Capital Dependent variable: *Ex Ante* Cost of Equity Capital

		Parameter Estimates (t-statistics in parenthesis)					
		Ordinary Least Squares				Two-Stage Least Squares[a]	
Variable	**Predicted Sign**	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	?	0.118	−0.031	0.109	−0.014	0.107	0.113
		(3.64)***	(−0.39)	(3.38)***	(−0.21)	(2.95)***	(4.09)***
YR	?	0.017	0.008	0.013	0.004	0.017	0.013
		(1.18)	(0.79)	(1.62)	(0.39)	(0.84)	(1.53)
LEV	+	0.008	0.009	0.016	0.019	0.014	0.009
		(0.56)	(0.55)	(1.03)	(1.35)*	(0.62)	(1.21)
ROA	−	−0.253	−0.209	−0.252	−0.201	−0.268	−0.252
		(−3.19)***	(−4.94)***	(−3.22)***	(−2.71)***	(−1.90)**	(−3.99)***
LASSET	−	−0.002	−0.001	−0.001	0.002	−0.001	−0.005
		(−0.31)	(−0.77)	(−0.29)	(0.73)	(−0.45)	(−0.74)
VAR	+	−0.001	−0.001	−0.001	0.001	−0.002	−0.001
		(−0.79)***	(−3.16)***	(0.88)	(1.91)**	(−0.75)***	(1.87)**
INFLATION	+	0.007	0.004	0.007	0.006	0.007	0.006
		(7.68)***	(0.15)	(7.59)***	(2.00)**	(4.78)***	(4.70)***
ANTIDIR	−	−0.006		−0.004		−0.034	−0.016
		(−1.77)**		(−1.84)**		(−1.33)*	(−1.69)**
STRUCTURE	−	−0.010		−0.012		−0.019	−0.003
		(−1.83)**		(−2.11)**		(−0.63)	(−1.25)
DISC_RAW	−	−0.005	−0.0009			−0.018	
		(−1.61)*	(−1.75)**			(−1.59)*	
DISC_SCALED	−			−0.051	−0.001		−0.001
				(−2.57)***	(−1.54)*		(−1.79)**
Country fixed effects		Excluded	Included	Excluded	Included	Excluded	Excluded
Adjusted R^2		0.27	0.43	0.28	0.44	0.22	0.32
n		274	274	274	274	274	274

(*continued on next page*)

TABLE 8 (Continued)

---

*, **, *** Significant at 0.10, 0.05, and 0.01 (all one-tailed except intercept and *YR*), respectively.

[a] In the two-stage least squares estimations, *DISC_RAW* and *DISC_SCALED* are the fitted values obtained by using the set of variables (*EXTDEP*, *YR*, *LASSET*, *LEV*, *CROSS_LIST*, *ANTIDIR*, and *STRUCTURE*) in disclosure Equation (1) as instruments.

Variable Definitions:

Cost of equity = the *ex ante* cost of equity capital using the price-earnings growth (PEG) ratio (Easton 2004);
YR = 1 if disclosure data is for 1993, 0 otherwise for 1991 data;
LEV = short- and long-tem debt-to-total assets;
ROA = return on assets;
LASSET = natural log of total assets;
VAR = variability of earnings as measured by the dispersion of analysts forecasts;
EXTDEP = average ratio of capital expenditures financed by external funds for U.S. firms in the same industry between 1980–1989. Source: Rajan and Zingales (1998);
CROSS_LIST = 1 if a firm is cross-listed in a foreign exchange, 0 otherwise;
INFLATION = consumer price index reflecting changes in the cost of acquiring a fixed basket of goods and services by the average consumer. Source: IMF (2003);
ANTIDIR = an index based on six specific elements of investor protection dealing with ability of outsider investors to challenge the control of the firm by inside owners and directors. Source: La Porta et al. (1998).
STRUCTURE = log of (ratio of stock market capitalization to claims on private sector by commercial banks). Source: Beck and Levine (2000);
DISC_RAW = CIFAR disclosure score − Country minimum CIFAR Disclosure Score; and
DISC_SCALED = (CIFAR disclosure score − Country minimum CIFAR Disclosure Score)/Country minimum CIFAR Disclosure Score, or equivalently CIFAR disclosure score/Country minimum CIFAR Disclosure Score − 1.

As expected, we find that firm-level voluntary disclosures are consistently higher for firms *around the world* in those industries with a greater need for external financing, after controlling for country-level institutional factors. Our results also indicate that firm-level disclosure incentives operate independently of country-level factors, although country-level factors also affect disclosure levels in predictable ways. While we are unable to detect interaction effects between firm-level disclosure incentives and country-level legal and financial systems, low power of the tests cannot be ruled out as an explanation for our inability to detect an interaction effect.

We also document that the consequence of expanded disclosure for firms with higher disclosure levels is a lower cost of both debt and equity capital. The implication is that firm-level voluntary disclosure incentives appear to operate globally irrespective of a country's legal and financial system that might limit the effectiveness of such disclosures. This is the most surprising result in the study, but at the same time it also provides evidence on the global importance of voluntary disclosure in gaining access to lower cost of capital.

It is important to consider several caveats regarding our results. First, our external financing dependence metric is potentially associated with other firm characteristics. Thus, despite control for several firm-level factors associated with the voluntary disclosure decision, it is possible that an unidentified correlated omitted variable influences the analysis. Second, the validity of our results documenting how disclosure incentives translate into capital market benefits in light of differing institutional environments depends on the reliability of the cost of capital estimates used in this study. To the extent that financial reporting practices, with respect to the presentation of interest expense, differ across the countries in our sample, there is a potential for measurement error in our cost of debt capital proxy. There is also paucity of evidence on the reliability of the cost of equity capital estimate used in this study as a proxy for expected returns in an international setting, even though recent research by Easton and Monahan (2005) using U.S. data indicates that our proxy contains no more measurement errors than other accounting-based measures of expected returns. Finally, our empirical tests model the cost of debt and equity separately without considering the potential trade-off between debt and equity capital. To the extent that the choice between these separate instruments is interrelated and conditional on a firm's decision to utilize external financing, our cost of capital tests suffer from simultaneity bias.

Our study also provides empirical evidence pertinent to the recurring debate on the extent to which disclosures should be driven by mandatory regulation versus firm-specific (voluntary) incentives. In making a case that mandated disclosure requirements may not be necessary, Kothari (2001) advocates allowing companies to voluntarily choose the amount of disclosure they make. Under this view, an interior optimal level of firm disclosure is obtained by trading off the costs and benefits of expanded disclosure policy. Alternatively, La Porta et al. (2000) argue that mandatory disclosure rules constitute a central feature of financially developed markets because they provide investors with basic information they need to exercise their rights. Under this view, high-quality minimum disclosure standards, combined with effective enforcement, creates the minimum amount of information each investor has the right to expect from every firm competing for funds (Lago 2001). Our results indicate that disclosure levels are not only associated with a country's financial and legal system, but also with a firm-specific factor (dependence on external financing). The implication is that country-level mandated disclosures do not negate the incentives for firm-level voluntary disclosure. In our study, we show that the firm-specific incentives with respect to external financing needs operate globally, independently of country-specific factors that also affect disclosure levels in predicted ways. In other words, *both* firm-specific voluntary incentives as well as country-level institutional characteristics appear to affect observed disclosure levels.

REFERENCES

Ahmed, K., and J. Courtis. 1999. Associations between corporate characteristics and disclosure levels in annual reports: A meta analysis. *British Accounting Review* 31: 35–61.

Ali, A., and L. Hwang. 2000. Country-specific factors related to financial reporting and the value relevance of accounting data. *Journal of Accounting Research* 38: 1–21.

Amihud, Y., and H. Mendelson. 1986. Asset pricing and the bid-ask spread. *Journal of Financial and Economics* 17: 223–249.

Association for Investment Management and Research (AIMR), Corporate Information Committee. 1982–1995. *An Annual Review of Corporate Reporting Practices*. Charlottesville, VA: AIMR.

Baiman, S., and R. Verrecchia. 1996. The relation between capital markets, financial disclosure, production efficiency, and insider trading. *Journal of Accounting Research* 34: 1–22.

Ball, R., and G. Foster. 1982. Corporate financial reporting: A methodological review of empirical research. *Journal of Accounting Research* 10: 161–234.

———, S. Kothari, and A. Robin. 2000. The effect of international institutional factors on properties of accounting earnings. *Journal of Accounting and Economics* 29 (February): 1–51.

Bamber, L., and Y. Cheon. 1998. Discretionary management earnings forecast disclosure: Antecedents and outcomes associated with forecast venue and forecast specificity choices. *Journal of Accounting Research* 36: 167–190.

Barry, C., and S. Brown. 1985. Differential information and security market equilibrium. *Journal of Financial and Quantitative Analysis* 20: 407–422.

Beck, T., and R. Levine. 2000. New firm formation and industry growth: Does having a market- or bank-based system matter? Working paper, World Bank, Washington, D.C.

———, and ———. 2002. Industry growth and capital allocation: Does having a market- or bank-based system matter? *Journal of Financial Economics* 64: 147–180.

Bhattacharya, U., H. Daouk, and M. Welker. 2003. The world price of earnings opacity. *The Accounting Review* 78: 641–678.

Botosan, C. 1997. Disclosure level and the cost of equity capital. *The Accounting Review* 20: 323–349.

———, and M. Plumlee. 2002. A re-examination of disclosure level and the expected cost of equity capital. *Journal of Accounting Research* 40: 21–40.

———, and ———. 2005. Assessing alternative proxies for the expected risk premium. *The Accounting Review* 80: 21–53.

Bowman, R. 1979. The theoretical relationship between systematic risk and financial (accounting) variables. *Journal of Finance* 34: 617–630.

Bushman, R., and A. Smith. 2001. Financial accounting information and corporate governance. *Journal of Accounting and Economics* 32: 237–333.

———, J. Piotroski, and A. Smith. 2004. What determines corporate transparency? *Journal of Accounting Research* 42: 207–252.

Center for International Financial Analysis and Research (CIFAR). 1993. *Global Company Handbook.* 2nd edition. Princeton, NJ: CIFAR Publications Inc.

———. 1995. *Global Company Handbook.* 3rd edition. Princeton, NJ: CIFAR Publications Inc.

Choi, F. 1973. Financial disclosure in relation to a firm's capital costs. *Accounting and Business Research* 4: 282–292.

Claus, J., and J. Thomas. 2001. Equity premia as low as three percent? Empirical evidence from analysts' earnings forecasts for domestic and international stock markets. *Journal of Finance* 56: 1629–1666.

Coles, J., U. Loewenstein, and J. Suay. 1995. On equilibrium pricing under parameter uncertainty. *Journal of Financial and Quantitative Analysis* 30: 347–364.

Doupnik, T., and S. Salter. 1995. External environment, culture and accounting practice: A preliminary test of a general model of international accounting development. *International Journal of Accounting* 30: 189–207.

Easton, P. 2004. PE ratios, PEG ratios, and estimating the implied expected rate of return on equity capital. *The Accounting Review* 79: 73–95.

———, and S. Monahan. 2005. An evaluation of accounting-based measures of expected returns. *The Accounting Review*: 80 (2): 501–538.

Fabozzi, F. 1997. The structure of interest rates. In *The Handbook of Fixed Income Securities*, edited by F. Fabozzi. Chicago, IL: Irwin Professional Publishing.

Francis, J., I. Khurana, and R. Pereira. 2003. The role of accounting and auditing in corporate governance, and the development of financial markets around the world. *Asia-Pacific Journal of Accounting and Economics* 10: 1–31.

Frankel, R., M. McNichols, and P. Wilson. 1995. Discretionary disclosure and external financing. *The Accounting Review* 70: 135–150.

Galai, D., and R. Masulis. 1976. The option pricing model and the risk factor of stock. *Journal of Financial Economics* 3: 53–82.

Gebhardt, W., C. Lee, and B. Swaminathan. 2001. Toward an implied cost of capital. *Journal of Accounting Research* 39 (1): 135–176.

Gode, D., and P. Mohanram. 2003. Inferring the cost of capital using the Ohlson-Juettner model. *Review of Accounting Studies* 8: 399–431.

Hail, L., and C. Leuz. 2003. International differences in cost of equity capital: Do legal institutions and securities regulation matter? Working paper, European Corporate Governance Institute.

Hamada, R. 1972. The effect of the firm's capital structure on the systematic risk of common stocks. *Journal of Finance* 27: 435–452.

Handa, P., and S. Linn. 1993. Arbitrage pricing with estimation risk. *Journal of Financial and Quantitative Analysis* 28: 81–100.

Harris, T., M. Lang, and H. Moller. 1994. The value relevance of German accounting measures: An empirical analysis. *Journal of Accounting Research* 32: 187–209.

Hausman, J. 1978. Specification tests in econometrics. *Econometrica* 46 (November): 1251–1271.

Hayes, R., and R. Lundholm. 1996. Segment reporting to the capital market in the presence of a competitor. *Journal of Accounting Research* 34: 261–279.

Healy, P., and K. Palepu. 1993. The effect of firms' financial disclosure strategies on stock prices. *Accounting Horizons* 1 (March): 1–11.

———, A. Hutton, and K. Palepu. 1999. Stock performance and intermediation changes surrounding sustained increases in disclosure. *Contemporary Accounting Research* 16 (Fall): 485–520.

———, and K. Palepu. 2001. Information asymmetry, corporate disclosure, and the capital markets: A review of the empirical disclosure literature. *Journal of Accounting and Economics* (September): 405–440.

Hope, O. 2003. Disclosure practices, enforcement of accounting standards, and analysts' forecast accuracy: An international study. *Journal of Accounting Research* 41 (May): 235–272.

Hubbard, G. 1998. Capital-market imperfections and investment. *Journal of Economic Literature* 36: 193–225.

Hung, M. 2000. Accounting standards and value relevance of financial statements: An international analysis. *Journal of Accounting and Economics* 30 (December): 401–420.

International Monetary Fund (IMF). 2003. *International Financial Statistics*. Washington, D.C.: IMF.

Jacobson, R., and D. Aaker. 1993. Myopic management behavior with efficient, but imperfect financial markets: A comparison of information asymmetries in the U.S. and Japan. *Journal of Accounting and Economics* (October): 383–406.

Jaggi, B., and P. Low. 2000. Impact of culture, market forces, and legal system on financial disclosures. *International Journal of Accounting* 35: 459–519.

Khanna, T., K. Palepu, and J. Chang. 2000. Analyst activity around the world. Working paper, Harvard University, Boston, MA.

King, R., G. Pownall, and G. Waymire. 1990. Expectations adjustments via timely management forecasts: Review, synthesis, and suggestions for future research. *Journal of Accounting Literature* 9: 113–144.

Kothari, S. 2001. The role of financial reporting in reducing financial risks in the market. In *Building an Infrastructure for Financial Stability*, edited by E. Rosengren, and J. Jordan, 89–102. Boston, MA: Federal Reserve Bank of Boston.

La Porta, R., F. Lopez-de-Silanes, A. Shleifer, and R. Vishny. 1997. Legal determinants of external finance. *Journal of Finance* 52: 1131–1150.

———, ———, ———, and ———. 1998. Law and finance. *Journal of Political Economy* 106: 1113–1155.

———, ———, ———, and ———. 2000. Investor protection and corporate governance. *Journal of Financial Economics* 58: 3–27.

———, ———, ———, and ———. 2002. Investor protection and corporate valuation. *Journal of Finance* 57: 1147–1170.

Lago, M. 2001. The role of financial reporting: Discussion. In *Building an Infrastructure for Financial Stability*, edited by E. Rosengren, and J. Jordan, 103–107. Boston, MA: Federal Reserve Bank of Boston.

Lang, M., and R. Lundholm. 1993. Cross-sectional determinants of analyst ratings of corporate disclosures. *Journal of Accounting Research* 31: 246–270.

———, and ———. 2000. Voluntary disclosure and equity offerings: Reducing information asymmetry or hyping the stock? *Contemporary Accounting Research* 17: 623–662.

———, K. Lins, and D. Miller. 2003. ADRS, analysts, and accuracy: Does cross-listing in the Unites States improve a firm's information environment and increase market value? *Journal of Accounting Research* 31: 317–345.

Leftwich, R. 1981. Evidence on the impact of mandatory changes in accounting principles on corporate loan agreements. *Journal of Accounting and Economics* 3: 3–30.

Levine, R., and S. Zervos. 1998. Stock markets, banks, and economic growth. *American Economic Review* 88: 537–558.

———, N. Loayza, and T. Beck. 2000. Financial intermediation and growth: Causality and causes. *Journal of Monetary Economics* 46: 31–77.

Nagar, V., D. Nanda, and P. Wysocki. 2003. Discretionary disclosure and stock based incentives. *Journal of Accounting and Economics* 34: 283–309.

Ohlson, J., and B. Juettner-Nauroth. 2000. Expected EPS and EPS growth as determinants of value. Working paper, New York University, NY.

Rajan, R., and L. Zingales. 1998. Financial dependence and growth. *American Economic Review* 88: 559–586.

Reese, W., and M. Weisbach. 2003. Protection of minority shareholder interests, cross-listings in the United States, and subsequent equity offerings. *Journal of Financial Economics* 66: 65–104.

Sengupta, P. 1998. Corporate disclosure quality and the cost of debt. *The Accounting Review* 73: 459–474.

Stein, J. 2001. Agency costs, information, and capital investment. In *Handbook of the Economics of Finance*, edited by G. Constantinides, M. Harris, and R. Stulz, 109–163. Amsterdam, Holland: North-Holland.

Verrecchia, R. 1983. Discretionary disclosure. *Journal of Accounting and Economics* 5: 179–194.

———. 1990. Endogenous proprietary costs through firm interdependence. *Journal of Accounting and Economics* 12: 245–250.

———. 2001. Essays on disclosure. *Journal of Accounting and Economics* 32: 97–180.

Welker, M. 1995. Disclosure policy, information asymmetry, and liquidity in equity markets. *Contemporary Accounting Research* 11: 801–827.

THE ACCOUNTING REVIEW
Vol. 80, No. 4
2005
pp. 1163–1192

Effects of Accounting-Method Choices on Subjective Performance-Measure Weighting Decisions: Experimental Evidence on Precision and Error Covariance

Ranjani Krishnan
Michigan State University

Joan L. Luft
Michigan State University

Michael D. Shields
Michigan State University

ABSTRACT: Performance-measure weights for incentive compensation are often determined subjectively. Determining these weights is a cognitively difficult task, and archival research shows that observed performance-measure weights are only partially consistent with the predictions of agency theory. Ittner et al. (2003) have concluded that psychology theory can help to explain such inconsistencies. In an experimental setting based on Feltham and Xie (1994), we use psychology theories of reasoning to predict distinctive patterns of similarity and difference between optimal and actual subjective performance-measure weights. The following predictions are supported. First, in contrast to a number of prior studies, most individuals' decisions are significantly influenced by the performance measures' error variance (precision) and error covariance. Second, directional errors in the use of these measurement attributes are relatively frequent, resulting in a mean underreaction to an accounting change that alters performance measurement error. Third, individuals seem insufficiently aware that a change in the accounting for one measure has spillover effects on the optimal weighting of the other measure in a two-measure incentive system. In consequence, they make performance-measure weighting decisions that are likely to result in misallocations of agent effort.

We appreciate the research assistance of Annie Farrell, Christian Mastilak, and Alex Woods on this project. We also thank Mark Nelson, Steve Salterio, Marlys Lipe (editor), two anonymous reviewers, and workshop participants at Cornell University, Emory University, University of Kentucky, Michigan State University, Queens University, University of California, Riverside, University of Washington, and Washington University for their comments.

Editor's note: This paper was accepted by Marlys Lipe.

Submitted May 2004
Accepted February 2005

Keywords: *decision performance; incentive compensation; mental models; performance measures.*

Data Availability: *Data are available from the second author on request.*

I. INTRODUCTION

Accounting research has long stressed the insufficiency of any single financial measure as a basis for evaluating and rewarding employees, because no single measure is a perfect indicator of the employee actions that the evaluation and reward system is intended to motivate (Banker and Datar 1989; Feltham and Xie 1994; Datar et al. 2001). The use of multiple performance measures is therefore widespread in organizations, but it raises nontrivial problems of how diverse measures should be weighted to make overall performance evaluation and reward decisions (Hemmer 1996; Ittner and Larcker 1998). Agency theory predicts that performance-measure weights will depend on how informative the measures are about agents' actions and how congruent the measures are with the principal's welfare (Banker and Datar 1989; Feltham and Xie 1994; Datar et al. 2001). However, archival studies that test associations between actual performance-measure weights and proxies for informativeness and congruity have reported mixed results (Bushman et al. 1995; Ittner et al. 1997; Ittner et al. 2003).

Empirical research shows that weights on multiple performance measures for incentive compensation are typically based on subjective judgment, often by individuals who are not compensation experts, such as front-line supervisors, branch managers, or small-business owners (Baker et al. 1994; Ittner and Larcker 1998; Banker et al. 2000; Ittner et al. 2003; Gibbs et al. 2004). Case studies provide examples of the difficulty, uncertainty, and interpersonal conflict that managers experience in deciding which performance-measure weights will best motivate employees to achieve a given goal (Davila and Simons 1997; Ittner et al. 2003). Identifying the cognitive sources of this difficulty can help to explain performance-measure weighting practice. Ittner et al. (2003) provide archival evidence on the subjective weighting of performance measures and conclude that psychology-based explanations of subjective performance-measure weighting "may be equally or more relevant than economics-based explanations in understanding measurement practices in some settings" (Ittner et al. 2003, 754).

We examine how nonexpert individuals' choice of weights on two performance measures are influenced by a change in the error variance (precision) of one measure and its error covariance with the second measure. We operationalize Feltham and Xie's (1994) multiple-action, multiple-measure agency model in an experimental setting where participants choose *ex ante* weights on two performance measures (product cost and product quality) in an incentive system for plant managers. We manipulate the precision of the product cost measure by using different capacity-costing methods;[1] we also manipulate the covariance between the error in the cost measure and the error in the product quality measure. If participants behave as Feltham and Xie's (1994) model predicts, then they will put a higher (lower) weight on both cost and quality measures when the precision of the cost measure is higher (lower) and when the negative error covariance between the two measures is higher (lower) in absolute value.[2]

---

[1] The precision of a performance measure can be influenced by a variety of factors, including the task environment (see, for example, Prendergast 2002) and the accounting method. Research in psychology shows that individuals' responses to precision in information can depend on the source of the precision (Nisbett et al. 1983). In this study we focus on understanding the effects of precision differences that arise from accounting-method differences, keeping the task environment constant.

Based on psychology research on mental models (Markman 1999; Markman and Gentner 2001), we predict and find that the precision of the cost measure influences most experiment participants' choices of cost-measure weights, but significantly less often influences their choices of quality-measure weights. That is, participants seem insufficiently aware that a change in the accounting for the cost measure has a spillover effect on the optimal weighting of the other performance measure.

The error covariance of the two performance measures influences most participants' choices of weights on *both* measures. However, we predict and find that participants' responses to differences in both precision and error covariance are often directionally incorrect. For example, many participants increase the weight on an accounting measure when its precision increases, as agency theory predicts, but a substantial minority of participants decrease the weight. In consequence, the *mean* response is an under-reaction to the accounting-method change.

Three important generalizations can be derived from this study. First, the errors in performance-measure weighting decisions by nonexpert individuals are not merely random: some types of errors are more frequent than others, and identifying these errors can aid in explaining and predicting the use of accounting measures in performance evaluation. Second, mental-model theories in psychology can be used not only to explain and predict the decisions in this study but also to generate predictions about a variety of other accounting-related judgments and decisions. Third, the errors made in the agency setting are systematically different from those made in nonagency (i.e., single-person and competitive market) settings. In nonagency settings, error variance and covariance are often neglected or underused; but to the extent that they are used, their use is directionally consistent with optimizing models (e.g., Lipe 1998; Maines 1990; Nelson et al. 2001). In our agency setting, in contrast, individuals rarely neglect error variance and covariance but often use them directionally incorrectly. This reversal of the pattern of errors indicates a need for caution in generalizing from agency settings to nonagency settings or vice versa. Although similar judgments and decisions are made in both settings (e.g., how much to rely on an imprecise indicator), and errors are often made in both settings, individuals are likely to make *different* errors in these different settings.[3]

The remainder of this paper is structured as follows. The next section develops hypotheses based on economics and psychology theories. The two subsequent sections describe the experimental method and results. The final section provides a discussion of the results including their limitations and implications.

II. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

Weighting multiple performance measures is particularly challenging when agents perform multiple tasks or actions, because optimal incentive contracts must be designed not only to induce the optimal *level* of total effort from the agent, but also to motivate an optimal *allocation* of total effort across the multiple actions. This section first introduces an agency model of multiple-action, multiple-measure incentive systems (Feltham and Xie 1994). Then we draw from the cognitive psychology literature to motivate predictions about how and why subjective performance-measure weights are expected to differ from the optimal weights in the Feltham and Xie (1994) model.

---

[2] Performance-measure weights are sometimes interpreted as percentages (e.g., 30 percent of a manager's target bonus is based on one measure while 70 percent is based on another measure). Under this interpretation, it would be impossible for both weights to increase or for both to decrease. The weights in Feltham and Xie (1994), however, are monetary amounts rather than percentages: both weights can increase (decrease) as the incentive intensity of pay increases (decreases).

[3] This error-pattern reversal is similar to Heath's (1999) finding that the direction of a judgment bias reverses between agency and nonagency settings. In agency (nonagency) settings, individuals systematically overestimate (underestimate) the effect of external influences on others' behavior, compared to the effect of these influences on their own behavior.

Three assumptions about the decision environment underlie our analysis. First, we assume the environment is one in which performance-measure weighting decisions are made by individuals who are not compensation experts, but who must nevertheless decide on rewards to motivate their subordinates, and who rely on multiple performance indicators to do so. Second, consistent with Ittner et al.'s (2003, 754) emphasis on "the evolutionary nature of compensation plans," we assume that individuals choose performance-measure weights by using a baseline such as last year's weights or the weights used in other, apparently successful, organizational units, rather than analyzing their own situation in isolation. They then modify this baseline to fit their own situation. Third, we assume that in some cases individuals will know the appropriate modifications from their own or others' past experience; but in many cases they will not have such a ready-made solution available and will need to reason through the implications of differences between the baseline and their own situation in order to choose appropriate performance-measure weights. Subsequent experience can help to fine-tune the weights, but the initial reasoning is important. As Brickley et al. (1996, 6) argue, "before any change is made, it is important [for managers] to analyze its likely consequences and forecast its impact on the firm ... uncritical experimentation can expose the firm to an uncomfortably high risk of failure." It is this initial reasoning we investigate in the present study.

Optimal Weighting of Multiple Performance Measures

Feltham and Xie (1994) model an agency setting in which an agent can allocate effort among multiple actions that have different effects on performance measures and on the principal's gross payoff. Optimal performance-measure weights in this model depend on three attributes of the measures: sensitivity, precision, and congruity. A measure is more *sensitive* when the agent's action has a larger expected effect on it. A measure is more *precise* when there is less variation in it due to uncontrollable events (i.e., events other than the agent's action). A measure is more *congruent* when an agent's action that does more to increase a performance measure also does more to increase the principal's gross payoff.

Accounting methods influence optimal performance-measure weights by influencing the sensitivity, precision, and congruity of accounting measures. We hold sensitivity and congruity constant and examine the decision effects of differences in the precision (or inversely, the error variance) of an accounting measure. Differences in the error variance of an accounting measure are likely to result in differences in the covariance between the error in the accounting measure and the error in other performance measures. We therefore also investigate the decision effects of differences in error covariance.

The Appendix presents the formal model in the two-action, two-measure setting used in this study and shows how it is used to generate optimal performance-measure weights with the parameter values employed in the experimental task. In the remainder of this subsection, we first describe the intuitive reasoning underlying the agency-model predictions of the effect of cost-measure precision on the cost-measure weight, then the effect of cost-measure precision on the quality-measure weight, and finally the effect of error covariance on both performance-measure weights.

Cost-Measure Precision and Cost-Measure Weights

The reasoning represented in Figure 1 shows the possible effects of a change in cost-measure precision on cost-measure weighting decisions, holding sensitivity and congruity constant. These effects are described in terms of comparison to a baseline level of cost-measure precision and a baseline cost-measure weight.

Links 1A through 7A in Figure 1 describe the reasoning of individuals who employ a subjective version of the agency model, while links 1B, 2B, 5B, and 6B represent alternatives to agency-model reasoning. Individuals with subjective agency models attend to differences in the precision of performance measures (link 1A) and reason that basing incentive compensation on a less precise measure will result in more variable (risky) compensation to the agent for any given level of cost-reduction effort (link 2A). This variability is unattractive to the risk-averse agent (link 3A). Consequently, the agent will require a higher expected payoff in return for a given amount of effort when the risk is higher (link 4A): motivating effort by the agent will be more costly because it includes a larger risk premium. When the price of cost-reduction effort is higher, the agent's effort becomes a more costly input, and the principal acquires less of it in equilibrium. Thus, the optimal response to lower precision of the cost measure is a lower cost-measure weight (link 5A).

Cost-Measure Precision and Quality-Measure Weights

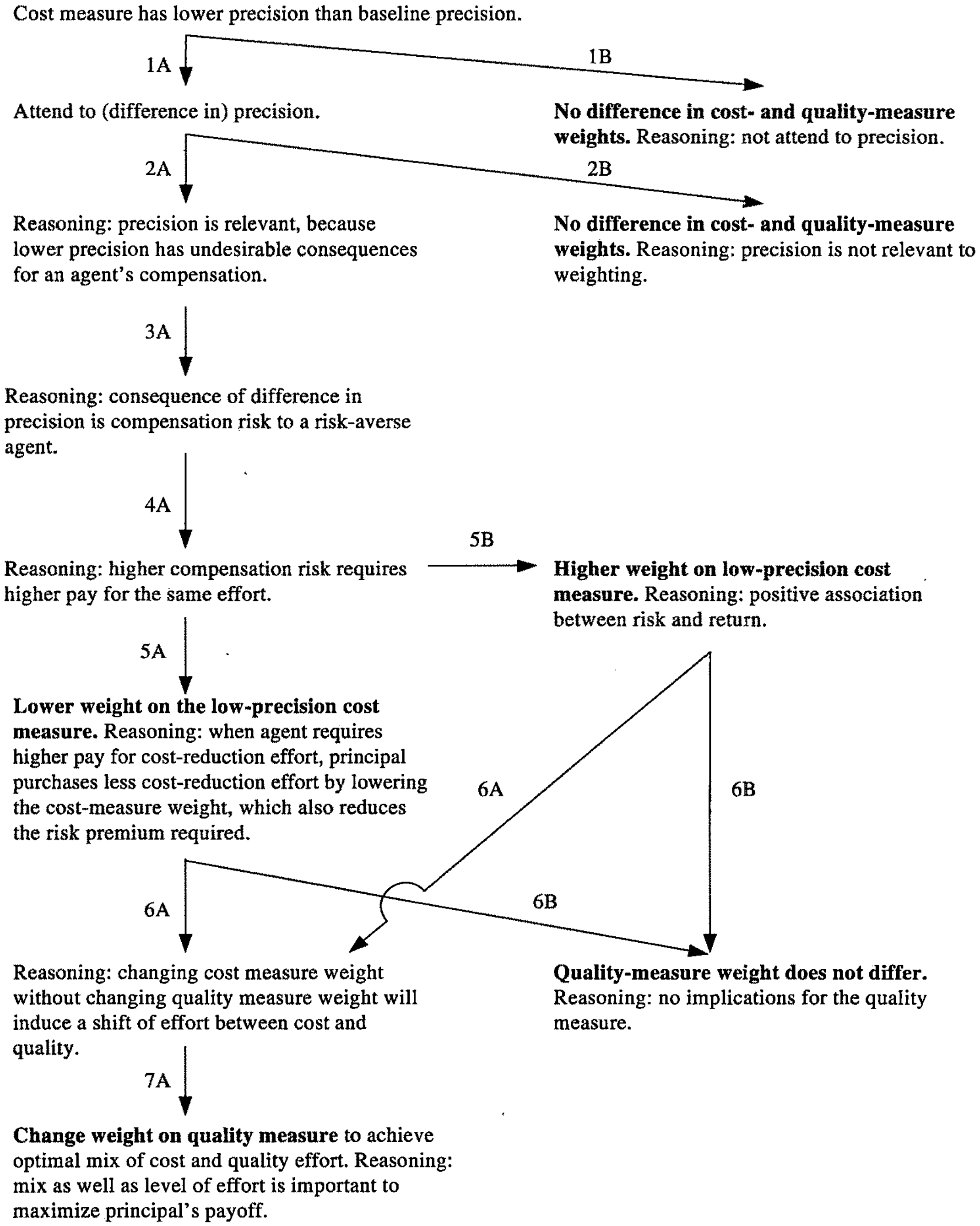
Figure 1 also shows the effect of cost-measure precision on the quality-measure weight in a setting where both cost and quality are valuable to the principal. In this setting, the incentive system is designed to motivate not only the optimal overall *level* of effort, but also the optimal *allocation* of total effort among the actions. A level of total effort that is optimal if its allocation is appropriately balanced between cost- and quality-related actions will often not be optimal if the effort is devoted only to cost or only to quality.

In consequence, if a different cost-measure weight is chosen in response to a difference in cost-measure precision, then a different quality-measure weight must also be chosen to maintain the optimal balance. To understand why, consider a principal who chooses a lower weight on the cost measure in response to reduced cost-measure precision, but does not change the weight on the quality measure. The agent will then shift effort away from cost reduction (for which the relative payoff has decreased) and toward quality improvement, to an extent that is not optimal for the principal. (Banker et al. [2002] document an example of such effort-shifting.) Hence, when cost-measure precision is lower than the baseline level, the principal should lower the weights on *both* the cost and quality measures in order to maintain an optimal allocation (balance) of effort (links 6A and 7A in Figure 1). In the resulting equilibrium, the level of effort directed toward quality improvement will be lower than if the weight on the quality measure had remained unchanged, but the principal's expected payoff will be higher than it would be if the agent exerted a higher level of effort with a more unbalanced allocation. A similar line of reasoning predicts that when cost-measure precision is higher than the baseline level, the principal should put higher weights on both the cost and quality measures.

Error Covariance and Performance-Measure Weights

The reasoning underlying agency-model predictions of the effects of error covariance follows the same logic as the effects of cost-measure precision and is summarized in Figure 2. Holding cost-measure precision constant, the lower the absolute value of the negative error covariance among different measures is, the less the errors in different measures tend

FIGURE 1
Effects of Cost-Measure Precision on Cost- and Quality-Measure Weighting Decisions



Cost measure has lower precision than baseline precision.

Attend to (difference in) precision.

No difference in cost- and quality-measure weights. Reasoning: not attend to precision.

Reasoning: precision is relevant, because lower precision has undesirable consequences for an agent's compensation.

No difference in cost- and quality-measure weights. Reasoning: precision is not relevant to weighting.

Reasoning: consequence of difference in precision is compensation risk to a risk-averse agent.

Reasoning: higher compensation risk requires higher pay for the same effort.

Higher weight on low-precision cost measure. Reasoning: positive association between risk and return.

Lower weight on the low-precision cost measure. Reasoning: when agent requires higher pay for cost-reduction effort, principal purchases less cost-reduction effort by lowering the cost-measure weight, which also reduces the risk premium required.

Reasoning: changing cost measure weight without changing quality measure weight will induce a shift of effort between cost and quality.

Quality-measure weight does not differ. Reasoning: no implications for the quality measure.

Change weight on quality measure to achieve optimal mix of cost and quality effort. Reasoning: mix as well as level of effort is important to maximize principal's payoff.

(*continued on next page*)

FIGURE 1 (continued)

---

1. Agency reasoning for cost-measure weighting follows paths 1A, 2A, 3A, 4A, and 5A.
2. Agency reasoning for quality-measure weighting follows paths 1A, 2A, 3A, 4A, 5A, 6A, and 7A.
3. Incomplete reasoning based on the risk-return association follows paths 1A, 2A, 3A, 4A, and 5B for cost-measure weighting.
4. Incomplete reasoning based on the risk-return association follows paths 1A, 2A, 3A, 4A, 5B, 6A, and 7A for quality-measure weighting.
5. **Hypotheses**
   H1: Cost-measure precision influences cost-measure weights. Number of individuals arriving at links (5A + 5B) > number of individuals arriving at links (1B + 2B).
   H2: Directional errors in use of cost-measure precision are more frequent than errors of nonuse. Number of individuals arriving at link 5B > number of individuals arriving at links (1B + 2B).
   H3: Cost-measure precision influences cost-measure weight more frequently than it influences quality-measure weight. Number of individuals arriving at links (5A + 5B) > number of individuals arriving at link 7A.

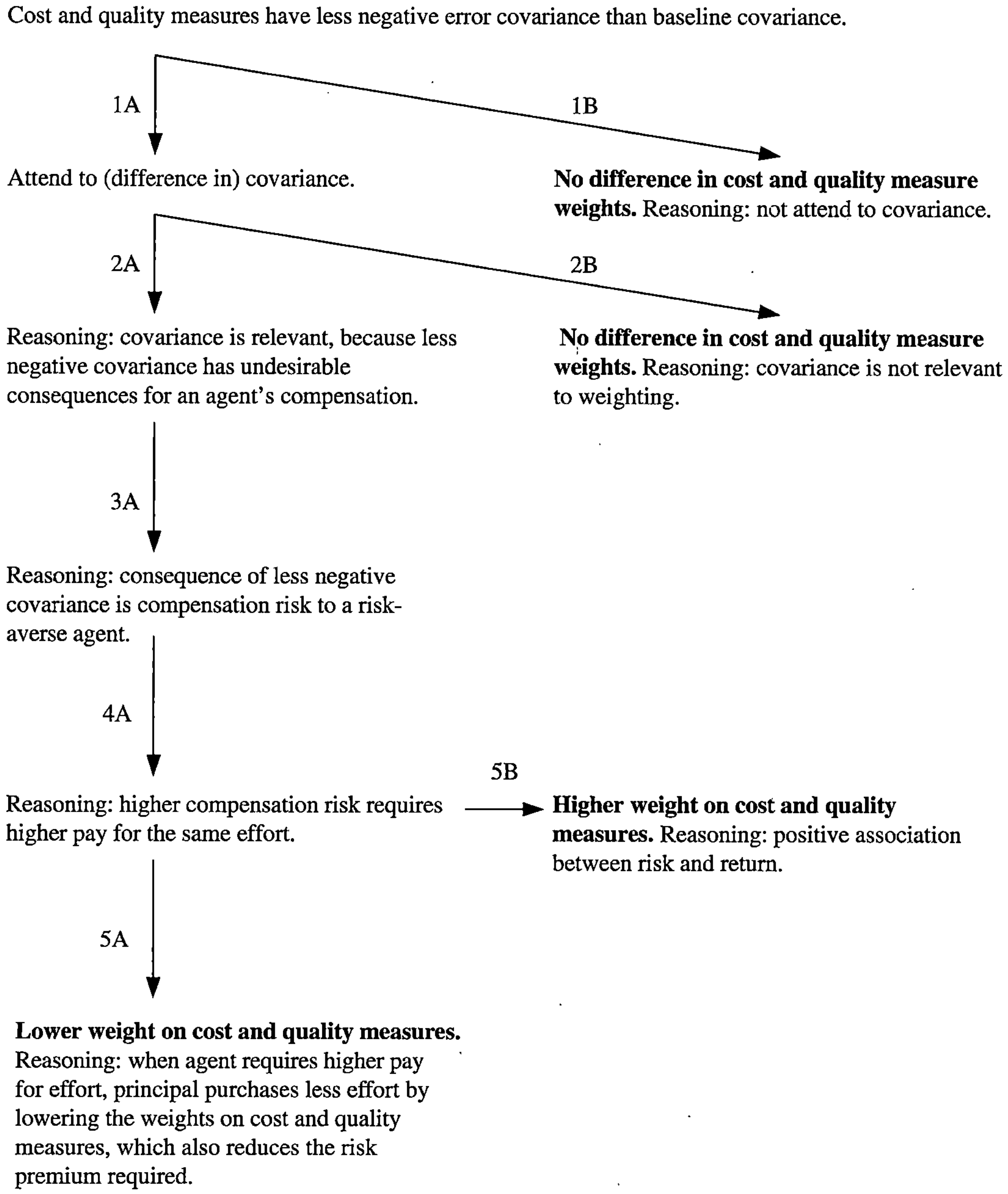
to cancel each other out when the measures are combined in an overall performance evaluation or bonus formula. The less the errors cancel out each other, the higher the risk to which the agent's compensation is exposed (links 1A, 2A, and 3A in Figure 2). As in the case of precision, when the error covariance level exposes the agent to higher compensation risk, a higher risk premium is required to motivate a given level of effort. The principal purchases less agent effort in equilibrium, because effort has become a more costly input. This lower level of effort purchase is achieved by a lower weight on the two performance measures (links 4A-5A in Figure 2).

Subjective Performance-Measure Weights and Mental Models

An agency model is a formal scientific representation of a system of causal relations that can be used to decide, explain, and predict performance-measure weights in incentive systems. Mental models are subjective, internal representations of systems of causal relations that can also be used to support decisions, explanations, and predictions of phenomena like performance-measure weights in incentive systems (Markman and Gentner 2001). Mental models usually differ from formal scientific models with respect to three properties, which we expect will affect subjective weighting of performance measures for incentive compensation (Markman 1999; Markman and Gentner 2001):

- Mental models are *qualitative* rather than quantitative: they represent directional relations (e.g., X increases or decreases Y) and approximate relative magnitudes of relations but not exact amounts (e.g., X_1 has a larger effect on Y than does X_2).
- Mental models often *substitute* more familiar attributes for the attributes in formal scientific models. Statistical attributes like conditional probability and covariance are often replaced by attributes like similarity, familiarity, and causal propensity, which individuals assess more naturally or spontaneously when examining their environment and access more readily in judgment and decision-making (Kahneman and Frederick 2002). In some but not all cases, using the natural attribute (e.g., causality) results in the same judgments and decisions as using the formal statistical attribute (e.g., covariance).
- Mental models are often *incomplete* compared to formal scientific models. They typically "neglect some of the information relevant to the behavior of the system" (Markman and Gentner 2001, 230). They are likely to include direct effects or short

FIGURE 2
Effects of Covariance on Cost- and Quality-Measure Weighting Decisions



Cost and quality measures have less negative error covariance than baseline covariance.

Attend to (difference in) covariance.

No difference in cost and quality measure weights. Reasoning: not attend to covariance.

Reasoning: covariance is relevant, because less negative covariance has undesirable consequences for an agent's compensation.

No difference in cost and quality measure weights. Reasoning: covariance is not relevant to weighting.

Reasoning: consequence of less negative covariance is compensation risk to a risk-averse agent.

Reasoning: higher compensation risk requires higher pay for the same effort.

Higher weight on cost and quality measures. Reasoning: positive association between risk and return.

Lower weight on cost and quality measures. Reasoning: when agent requires higher pay for effort, principal purchases less effort by lowering the weights on cost and quality measures, which also reduces the risk premium required.

---

1. Agency reasoning follows paths 1A, 2A, 3A, 4A, and 5A for cost- and quality-measure weights.
2. Incomplete reasoning based on the risk-return association follows paths 1A, 2A, 3A, 4A, and 5B for cost- and quality-measure weights.
3. **Hypotheses**
   H4: Error covariance influences cost- and quality-measure weights. Number of individuals arriving at links (5A + 5B) > (1B + 2B).
   H5: Directional errors in use of error covariance are more frequent than errors of non-use. Number of individuals arriving at link 5B > number of individuals arriving at links (1B + 2B).

causal chains (e.g., X influences Y) while omitting indirect effects or longer, more complex causal chains (e.g., W influences X, which influences Y, and both X and Y influence Z) (Sterman 1989; Diehl and Sterman 1995).

Because mental models are qualitative (property (1) above), our hypotheses are about the existence and direction, rather than the exact magnitude, of the effects of cost-measure precision and error covariance on performance-measure weights. The first three hypotheses (H1–H3) are related to individuals' use of performance-measure precision in choosing performance-measure weights, while H4 and H5 examine individuals' use of error covariance. We use the substitution property of mental models (property (2) above) to motivate H1 and H4, and the incompleteness property of mental models (property (3) above) to motivate H2, H3, and H5.

Use of Cost-Measure Precision in Performance-Measure Weighting

The first important way in which individuals' mental models can differ from the agency model is if individuals do not attend to measurement precision (Figure 1, link 1B) or attend to it but do not use it (link 2B). Failure to use precision can arise from multiple sources. Some individuals believe precision is irrelevant in principle to performance-measure weighting decisions; thus, they might either consider and reject precision as a determinant of weights or develop the habit of not attending to it. Interview- and survey-based research indicates that some managers believe that a manager's job description includes an obligation *not* to be risk-averse (March and Shapira 1987), which would make compensation risk irrelevant. Practitioner literature also includes instances of a belief that if some individuals in an organization are offered a bonus for performance, then others with jobs that are similar in some respect (rank, base pay, etc.) should be offered a similar bonus, without considering differences in measurability of performance (e.g., Santovec 2001).

Another possible reason for failure to use precision is that precision is an abstract statistical attribute of measures, and individuals rarely assess (i.e., attend to and estimate) such attributes naturally, without being prompted to do so (Nisbett et al. 1983; Kahneman and Frederick 2002). For any imperfect indicator, y, of any unknown value, a, where $y = \mu a + \varepsilon$, and ε is an error term with mean 0 and variance $\sigma^2(\varepsilon)$, precision is the inverse of the error variance $\sigma^2(\varepsilon)$. Prior research on nonagency judgments and decisions—for example, in estimations of unknown values in single-person or competitive-market settings—shows that individuals' judgments are often insufficiently, or not at all, responsive to differences in $\sigma^2(\varepsilon)$ when individuals are using y (e.g., a sample value, a current value) to make a judgment about a (e.g., a population value, a future value) (Tversky and Kahneman 1971; Borgida and Nisbett 1977; Griffin and Tversky 1992; Nelson et al. 2001).

We expect, however, that most individuals will attend to and use measurement precision in performance-measure weighting decisions (i.e., they will follow links 1A and 2A rather than 1B and 2B in Figure 1). The use of statistically valid reasoning is often *domain-specific* (Nisbett et al. 1983), and *in the domain* of the agency setting, individuals can substitute the cognitively more accessible but statistically identical attribute of controllability for precision.[4]

In Feltham and Xie's (1994, 433) definition of precision, high precision (low $\sigma^2(\varepsilon)$) represents low impact of "uncontrollable events influencing the performance measure." For a performance measure with a given amount of variability, the more controllable the measure is, the less of the total variation in the measure is due to $\sigma^2(\varepsilon)$ and more is due to variation in a (the agent's actions). Thus, for such a measure, an increase in precision is also an increase in controllability (i.e., a decrease in the uncontrollable variation represented by $\sigma^2(\varepsilon)$).[5]

Controllability is expected to be more cognitively accessible than precision, however, for two reasons. First, controllability is based on causal relations between an agent's actions and the related performance measure; and causality is a highly accessible attribute, which individuals are likely to use in judgments and decisions (Kahneman and Frederick 2002). Second, most management accounting textbooks discuss controllability (e.g., Atkinson et al. 2004; Horngren et al. 2006; Zimmerman 2006), and practitioner literature emphasizes the desirability of choosing more controllable performance measures (Chingos and Peat Marwick 1997; Heneman 2001; Niven 2002). Thus, individuals with some business training or experience have probably been exposed to the idea that a performance measure is more valuable when it is more controllable by the agent whose performance is being evaluated.[6]

As noted earlier, the cognitive accessibility of the attributes of a stimulus—the ease with which they come to mind and the extent to which they are assessed spontaneously—is an important determinant of their influence on judgments and decisions (Kahneman 2003). Because controllability is cognitively accessible and is statistically identical to precision in our agency setting, we expect that precision will influence performance-measure weighting decisions. That is, we expect that more individuals will arrive at links 5A and 5B in Figure 1 (influence of precision on cost-measure weights) than at links 1B and 2B (no influence of precision on cost-measure weights).

H1: Cost-measure precision will influence individuals' subjective weights on the cost measure in a two-measure incentive system.

---

[4] The attribute substitution documented in this study is somewhat atypical, in that controllability and precision are statistically but not cognitively identical for the decision we examine (weighting performance measures over which the agent has nonzero influence). Most instances of attribute substitution involve attributes that are associated with each other but are neither statistically nor cognitively identical (Kahneman and Frederick 2002). For example, if individuals are asked to estimate the likelihood that firms' profits will decline after a merger (probability of profit decline conditional on a merger having taken place), some will instead answer as if they had been asked how easily instances of post-merger profit declines come to mind (availability). Availability is a more cognitively accessible attribute than conditional probability, but it is not statistically identical: events can be more available in memory because they are more probable and therefore have been more frequent, but they can also be more available because of recency, vivid media coverage, etc. and are not necessarily more probable.

[5] In decision settings where a is not an agent's action but a value such as future earnings or firm value (and y is, for example, current earnings), precision is not related to controllability. There is also one exception to the identity of these two attributes in the agency setting. If $\mu = 0$ (the agent's action has absolutely no influence on the performance measure), then $1/\sigma^2(\varepsilon)$ (precision) can vary without varying controllability, which remains at zero.

[6] The "controllability principle" as advocated in earlier literature often recommended not using any performance measures an individual could not completely control (for summaries of this literature, see Choudhury [1986] and Merchant [1985]). Thus, in the extreme, performance measures with nonzero error variance would not be used, and differences in nonzero error variance would be irrelevant. But more recent literature defines controllability as *degree* of influence rather than complete control over the measure and considers differences in degree of influence as relevant (e.g., Horngren et al. 2006; Atkinson et al. 2004).

The focus of H1 is on *whether* individuals attend to and use precision in their performance-measure weighting decisions, but not on whether they use it exactly as the agency model predicts. Our next hypothesis, H2, focuses on *how* individuals use precision.

Hypothesis 1 predicts that most individuals will recognize that a decrease in performance-measure precision increases the riskiness of agents' compensation, and that this is costly if agents are risk-averse. If individuals' reasoning is *incomplete* relative to the agency model, however, they may rely on their expectation of a positive association between risk and return and conclude that the weight on the cost measure should be higher (thus increasing the return to the agent for cost-reduction effort) when there is more risk, as some practitioner literature advocates (Bloom 1999, 28). This reasoning does not consider all of the consequences of responding to higher risk with higher performance-measure weights, however.

More complete agency-theory reasoning would consider that, while higher pay can compensate the agent for bearing more risk, increasing the weight on the performance measure increases that risk further, which requires an even higher risk premium. Moreover, as risk premiums increase, the cost of agent effort can rise above its value to the principal. As with any other input, when the price of agent effort is higher, the principal buys less agent effort in equilibrium. The principal "buys less effort" by putting a *lower* weight on the performance measure when its precision is lower, rather than the higher weight indicated by incomplete reasoning based on the risk-return association (link 5A versus 5B in Figure 1).

The directional error in performance-measure weights that we expect to result from such incomplete risk-return-based reasoning contrasts with the decision errors found in single-person judgment settings, where individuals often make insufficient use of precision and error covariance indicators (Borgida and Nisbett 1977; Griffin and Tversky 1992; Lipe 1998; Maines 1990), but do not often exhibit directionally incorrect use (so far as we are aware). In single-person or competitive-market settings, individuals need only reason through the consequences of precision to themselves (e.g., the uncertainty of return on an investment about which they have imprecise information). For individuals who find this uncertainty aversive, it does not require a long or complex chain of reasoning to decide that such an investment is unattractive.

In an agency setting, in contrast, individuals need to reason through how measurement precision will affect another individual, how the other individual will respond to these effects, how the other individual's responses will affect themselves, and how they should act in view of the other individual's expected behavior. Bloomfield (1997) and Wilks and Zimbelman (1999) have shown in audit-game settings that completing this strategic reasoning is rarer than completing the simpler reasoning by which individuals determine how a condition directly affects themselves. We expect similar results in our agency setting. Because individuals' reasoning often truncates long chains of indirect causal effects (i.e., mental models are often incomplete; Sterman 1989; Diehl and Sterman 1995), we expect that many individuals will not correctly complete the long chain of reasoning implicit in the agency model. Truncating the line of reasoning at link 5B will result in directional errors in cost-measure weighting.

To test our expectation of a distinctive pattern of response to cost-measure precision, based on the substitution and incompleteness properties of mental models, we predict a difference in the relative frequency of two deviations from the agency-model prediction. Hypothesis 2 predicts that because individuals readily access controllability (links 1A through 4A, Figure 1), but then do not reason completely through the consequences (link

5B instead of 5A), directional errors in the use of precision in cost-measure weights will occur more frequently than failure to use precision in the choice of cost-measure weights. That is, we expect that more individuals will arrive at link 5B than at links 1B and 2B.

> **H2:** Directional errors in the use of cost-measure precision will occur more frequently than failure to use cost-measure precision in individuals' choice of cost-measure weights.

The formal agency-theory model predicts that a change in the precision of the cost measure will influence the weights on *both* cost and quality measures. If decision error in subjective weighting is random, then errors of failure to use precision should be equally likely for both measures. In contrast, if subjective performance-measure weighting follows the reasoning shown in Figure 1, and if error is created by incompleteness in this reasoning, then failure to use cost-measure precision will *not* be equally likely for both performance measures. Specifically, when individuals change the weight on the cost measure (link 5A or 5B, Figure 1), many are likely to stop there rather than consider possible effects of the cost measure's precision on other performance measures (links 6A and 7A, Figure 1). Additional reasoning is required to infer that if the cost-measure weight is lowered, but the quality measure weight is unchanged, then the agent will shift too much effort toward quality improvement, and this suboptimal effort reallocation could be prevented by choosing a lower weight on the quality measure. Hypothesis 3 predicts that some individuals will not complete this additional reasoning and thus will choose different cost-measure weights but fail to choose different quality-measure weights. That is, we expect that more individuals will arrive at links 5A and 5B than at link 7A in Figure 1.

> **H3:** Individuals' subjective cost-measure weights will be influenced by cost-measure precision more frequently than will their subjective quality-measure weights.

Use of Error Covariance in Performance-Measure Weighting

We expect error covariance to influence subjective performance-measure weighting, although prior accounting-related experiments in nonagency settings have found significant underuse of covariance information. Lipe (1998) found that most participants in an experiment failed to use covariances of securities returns in investment decisions, even though they were experienced investors, they made appropriate use of the other information available to them (expected returns and variance of returns), and the covariance information was made salient through a within-subjects manipulation. In Maines (1990), participants used multiple sales or earnings forecasts that had different levels of individual-forecast error and error correlation across forecasts, in order to obtain the most accurate consensus forecast possible or to judge the accuracy of different consensus forecasts. Both financial analyst and M.B.A.-student participants failed to make use of error correlation when it was manipulated between-subjects. When error correlation was manipulated within-subjects, the majority of participants did not make use of error correlation when forecasts differed with respect to both individual accuracy (precision) and error correlation.

In our agency setting, however, we expect that individuals will use error covariance in their performance-measure weighting decisions even when precision varies as well, because (as with precision) they substitute the more cognitively accessible attribute of controllability. The higher the error covariance between two measures is (that is, the higher the absolute value of the negative covariance), the less a *combination* of the two measures is influenced by factors an agent cannot control, and the less the agent's compensation (based on the combination of measures) is exposed to uncontrollable risk (Figure 2). For example, an exogenous change in production volume that increases performance on a per-unit cost measure could also create stress in the production system that reduces quality performance. The more these two effects offset each other, the less an overall performance evaluation that depends on both will be influenced by uncontrollable events, and the higher the weight that can be put on both performance measures.

Because error covariance is a property of both performance measures, H4 predicts that it will influence the subjective performance measure weights on both measures. That is, more individuals will arrive at links 5A and 5B than at links 1B and 2B in Figure 2. Hypothesis 5 uses the logic underpinning H2, which assumes that most individuals will readily access controllability, but some will then invoke a risk-return relationship without reasoning completely through its consequences. These individuals will mistakenly put a higher (lower) weight on performance measures when compensation risk due to error covariance is higher (lower). As a result, H5 predicts a distinctive pattern of decision error: directional errors in the use of error covariance will be more frequent than failure to use error covariance in performance measure weighting. That is, more individuals will arrive at link 5B than at links 1B and 2B in Figure 2.

H4: The error covariance of cost and quality measures will influence individuals' subjective weights on both the cost and quality measures in a two-measure incentive system.

H5: Directional errors in the use of error covariance will occur more frequently than failure to use error covariance in individuals' choice of performance-measure weights.

III. EXPERIMENTAL METHOD

Participants

Thirty-two M.S. Accounting students and M.B.A. students who had completed at least one course in management accounting volunteered to participate in the experiment.[7] These participants had completed a mean of 2.03 three-hour semester length statistics courses (S.D. = 0.84, range 1–6) and 1.48 microeconomics courses (S.D. = 0.79, range 1–4). Their work experience as managers or accountants (not including nonprofessional work experience) ranged from zero to five years, with a mean of eight months. The participants were paid performance-contingent compensation, as described below.

Experimental Materials and Procedure

Participants received introductory materials explaining that their task was to "design bonus plans that will motivate [plant] managers to maximize the expected value that their plants add to the economic value of your firm." The materials then explained the setting in terms consistent with the Feltham and Xie (1994) model (risk-averse and effort-averse managers, risk-neutral firm owners, one-period decision setting, etc.) and the parameters shown in the Appendix (Table A1). Participants received parameter values and optimal weights for cost and quality measures at one of four plants (baseline plant); they then received parameter values and were asked to choose weights for the two performance measures at each of the other three plants, based on the separate information given for each plant (test plants).[8]

---

[7] Decision performance did not differ significantly between M.B.A. and M.S. students: correlations between degree program and decision errors identified in Table 1 were not significant (all $p > .05$)

One plant for which participants chose performance-measure weights differed from the baseline plant with respect to the precision of the cost measure, one plant differed from the baseline with respect to the error covariance of cost and quality measures, and one plant differed from the baseline with respect to both cost-measure precision and error covariance. Each of the four plants was used as the baseline for about one quarter of the participants. Participants received information on all four plants simultaneously. We expected that the provision of a baseline and the opportunity to compare it to all of the test plants simultaneously would simplify the participants' task. For example, a participant who received the information shown in Table A1 for the baseline plant had to decide whether to use this plant's performance-measure weights of $318 and $137 per unit of performance measure, or to modify them for another plant that was identical in every respect except for a change in capacity-costing method that increased the precision of the unit product cost.

To deter concerns about the morale effect of incentive systems that varied across plants, the experimental materials stated that the four plants were "distant from each other geographically and in terms of firm organization. The managers have no contact with each other, so you do not need to worry about negative effects on morale from managers' comparing bonus plans." In order to deter possible concerns that lower-than-baseline bonuses would result in compensation below the plant managers' reservation utility, the experimental materials stated that participants' decisions only determined how dependent the annual bonus was on these particular performance measures: "Your firm's human resources department designs managers' total compensation packages to be competitive in the managerial labor market."

Before they made their decisions, participants were told they would receive at least $7 for completing the experiment. They were also told that they could receive up to an additional $8 depending on the quality of their incentive design decisions. The closer their incentive decisions were to the optimum, the higher pay they would receive.[9]

Participants self-paced their way through the experimental materials. After they finished the experimental task, they turned in the materials and received a separate packet with post-experiment questions. These questions were intended to measure: (1) whether participants observed and correctly interpreted key elements in the experimental materials, such as differences in precision and error covariance across the four plants, the information on plant managers' preferences, etc.; (2) participants' level of interest in the experimental task and self-reported effort and motivation levels; (3) participants' explanations of their choice of performance-measure weights; (4) analytic ability, as measured by the GRE questions used as an ability measure in Bonner and Lewis (1990), Bonner et al. (1992), Bonner and Walker (1994), and Dearman and Shields (2005); and (5) participants' work experience and education.

---

[8] The experimental materials also included a performance-weighting decision in a one-measure setting (cost measure only) to familiarize participants with the task. Behavior in the one-measure setting was qualitatively consistent with behavior in the two-measure setting: participants responded to the change in cost precision but anchored on the baseline and often chose weight differences in the wrong direction.

[9] Actual pay was determined by calculating the total difference, across all weighting decisions, between the optimal performance-measure weights and the weights participants chose. The four participants with the smallest total differences received the full $8; the four with the next-smallest total error received $7, etc.

Experimental Design and Independent Variables

The experimental design was a 3 × 4, in which the three levels of the within-subjects factor were the three differences from a baseline in performance-measure attributes: difference in cost-measure precision, difference in error covariance of cost and quality measures, and difference in both cost-measure precision and error covariance. The use of a within-subjects manipulation of differences in performance-measure attributes was consistent with evidence that most incentive plans are *differences from* a previous plan or *adaptations of* a plan that was successful elsewhere, rather than being created without reference to other plans (Ittner et al. 2003). The four levels of the between-subjects factor were the four different combinations of baseline and test plants. The use of four different baseline plants, each with different combination of cost-measure precision and error covariance (and thus four different combinations of test plants), provided assurance that participants' weighting decisions were not specific to the parameters of a single baseline-to-test-plant comparison. The optimal performance-measure weights in the test plants were higher than in the baseline plant for some participants and lower than in the baseline plant for other participants; in addition, the difference between optimal weights in the baseline and test plants was relatively small for some participants and relatively large for others.

Because we were interested in examining individuals' responses to changes in performance-measure precision that arose from characteristics of the accounting method, we manipulated the precision of the cost measure by changing the method of allocating overhead capacity costs to units of product. The choice of denominator volume used to allocate fixed capacity costs to units of product is an important determinant of the precision of full unit product cost, and is the subject of debate in both practice and academic literature (Kaplan 1994; Buchheit 2003, 2004). The denominator volume can be either practical capacity or a production level (budgeted or actual) that fluctuates from period to period. The use of these two denominator volumes will be referred to as the *practical-capacity* and *actual-volume* methods, respectively.

Full unit cost fluctuates with actual production volume under the actual-volume but not the practical-capacity method. Thus for the plant managers described in the experimental materials, who had little or no control over actual production volume, full unit cost was a less precise measure under the actual-volume method than the practical-capacity method: it measured the manager's performance with more error. The descriptions of costing methods that the participants received are shown in the Appendix, Table A1. The description of precision was, "Standard deviation (uncertainty) of actual full unit product cost, due to factors beyond plant manager's control," with values of either \$0.20 (low precision) or \$0.14 (high precision).

Error covariance was manipulated by changing the value of a parameter labeled, "Relation between uncontrollable influences on cost and defect measures." The parameter had a value of either –0.007 (low) or –0.02 (high) and was explained to participants as follows:

> Some factors beyond the plant manager's control affect *both* production cost and defects. At this plant, these uncontrollable factors tend to have opposite effects on production cost and defects. This means that if uncontrollable factors *decrease* measured cost in a given period, they will tend to *increase* measured defects in that period ... This relationship is shown by the negative sign on the estimate of the *relation between uncontrollable influences* on the cost and defect measures. The larger the *absolute* value

of this estimate, the more likely it is that a large uncontrollable *increase* in costs will be accompanied by a large uncontrollable *decrease* in defects or vice versa.[10]

IV. RESULTS

Descriptive Statistics

Because the hypotheses predict the existence and direction, not the exact magnitude, of divergence from optimal decisions specified by the Feltham and Xie (1994) model, the classification of participants' decisions in Table 1 is based on the existence and direction of participants' response to differences in precision and error covariance. (The magnitudes of optimal and actual weight differences appear in Table 2 and are used in supplementary analyses.) The cells in Table 1 report the number of participants who made directionally correct use (column a), directionally incorrect use (column b), or no use (column c) of cost-measure precision and/or error covariance when one of these attributes differed from its baseline value, holding the other attribute constant.[11]

Over all of the 128 performance-measure weighting decisions in Table 1 (32 participants × 4 decisions per participant), decisions that are qualitatively consistent with the agency model are the most frequent (61 out of 128 decisions, column a). Participants whose decisions are reported in this column behave consistently with the qualitative agency reasoning shown in the "A" links in Figure 1 (1A through 5A for cost-measure weighting decisions, and 1A through 7A for quality-measure weighting decisions).

The second most frequent type of performance-measure weighting decision (45 out of 128 decisions, column b) is directionally incorrect use of precision and/or error covariance. These decisions are consistent with an incomplete version of agency reasoning that focuses on the risk-return relation but fails to infer all of its consequences (link 5B in Figures 1 and 2).

Failure to use precision and/or error covariance (22 decisions out of 128, column c) is relatively rare for most decisions in the experiment, although the frequencies differ considerably across the four rows in column c. In row 2, which reports quality-measure weighting decisions when cost-measure precision differs across plants, the frequency in column c (n = 12) is similar to frequencies in columns a and b. In the other three rows of column c, however, frequencies are lower than in all other cells in the table (n = 5, 4, and 1 for rows 1, 3, and 4, respectively).

Hypothesis Tests

To test the hypotheses, we used nonparametric statistics that provided high power and were not dependent on asymptotic properties of the relevant distributions; thus they were

---

[10] The term "controllable" was used explicitly in the manipulations, in order to provide participants with information they would be likely to have in the natural environment. For example, the superior of plant managers like those described in the experimental materials could be expected to know that the plant managers had little control over production volume. The experiment was intended to test how participants responded to known differences in controllability, rather than to test whether they could infer controllability from error variance and covariance statistics.

[11] When both attributes differed simultaneously from the baseline, participants' weighting decisions (not shown in Table 1) were similar to the decisions they made when only error covariance differed from the baseline.

TABLE 1
Descriptive Statistics and Tests of Hypotheses 1–5

Each cell reports the number of participants who made a given performance-measure weighting decision (Panel A) or pair of decisions (Panel B).

Panel A: Frequency of individual performance-measure weighting decisions when cost-measure precision or error covariance differs from baseline. References to Figures 1 and 2 indicate the links in the chain of reasoning that result in the decision reported in that cell. Total number of decisions = 32 participants × 4 decisions = 128.

	Difference in Performance-Measure Weights			
	a. Directionally Correct Difference	**b. Directionally Incorrect Difference**	**c. No Difference in Performance-Measure Weights**	**n**
Cost-Measure Precision Differs				
1. Cost-Measure Weighting Decision	15 Fig. 1: 5A	12 Fig. 1: 5B	5 Fig. 1: 1B+2B	32
2. Quality-Measure Weighting Decision	10 Fig. 1: 7A via 5A and 6A	10 Fig. 1: 7A via 5B and 6A	12 Fig. 1: 1B+2B+6B	32
Error Covariance Differs				
3. Cost-Measure Weighting Decision	14 Fig. 2: 5A	14 Fig. 2: 5B	4 Fig. 2: 1B+2B	32
4. Quality-Measure Weighting Decision	22 Fig. 2: 5A	9 Fig. 2: 5B	1 Fig. 2: 1B+2B	32
Total Number of Decisions	61	45	22	128

Panel B: Frequency of pairs of performance-measure weighting decisions when error covariance differs from baseline. This panel reclassifies the data in Panel A, rows 3 and 4. Panel A reports cost- and quality-measure weighting decisions independently; Panel B shows how individuals combined the two decisions (e.g., the decisions that appear in Panel A, cell 3c, appear in Panel B, rows 5d + 5e +5f).

Error Covariance Differs	**n**
5a. Both weights directionally correct	14
5b. Both weights directionally incorrect	8
5c. One weight directionally correct, one weight directionally incorrect	6
5d. One weight directionally correct, one weight not different from baseline	2
5e. One weight directionally incorrect, one weight not different from baseline	1
5f. Both weights not different from baseline	1
Total	32

Hypotheses and cell frequencies used in hypothesis testing:

H1: Cost-measure precision influences cost-measure weights. Panel A, cells (1a + 1b)/32 > 50 percent. Binomial test, $p < .01$.

H2: Directional errors in use of cost-measure precision are more frequent than errors of nonuse. Panel A, cells (1b)/(1b + 1c) > 50 percent. Binomial test, $p = .07$.

H3: Cost-measure precision influences cost-measure weight more often than it influences quality-measure weight. $\chi^2 = 5.14$, $p < .05$. (See text for details.)

H4: Error covariance influences cost- and quality-measure weights. Panel B, rows (5a + 5b + 5c/32) > 50 percent. Binomial test, $p < .01$.

H5. Directional errors in use of error covariance were more frequent than errors of nonuse. Panel A, cells 3b/(3b + 3c) > 50 percent, 4b/(4b + 4c) > 50 percent; Panel B, row 5b/(5b + 5f) > 50 percent. Binomial tests, all $p < .02$.

appropriate for small samples.[12] The first three hypotheses test predictions about participants' use of cost-measure precision. Hypothesis 1 predicts that when cost measure precision differs from the baseline, more individuals will choose different cost-measure weights (Figure 1, links 5A and 5B) than keep cost-measure weights the same for otherwise identical plants and managers (Figure 1, links 1B and 2B). When cost-measure precision differed (holding error covariance constant), 27 participants (84 percent: Table 1, cells (1a + 1b)/32) chose different weights on the cost measure, while five participants (16 percent: cell 1c/32) did not. A binomial test indicates that these two proportions are significantly unequal (84 percent > 50 percent, $p < .01$), providing support for H1.

Hypotheses 2 and 3 predict distinctive patterns of relative frequency of decision errors in individuals' responses to precision. Hypothesis 2 predicts that directional errors in individuals' use of precision (Figure 1, link 5B) will be more frequent than failure to use precision in cost-measure weighting (Figure 1, links 1B + 2B). When cost-measure precision differs from the baseline (holding error covariance constant), a marginally significant majority of the decision errors (12 out of 17, or 71 percent: cell 1b/(1b+1c)) are errors of direction rather than non-use (71 percent > 50 percent, binomial test, $p = .07$). These results are consistent with H2.

Hypothesis 3 predicts that cost-measure precision will influence individuals' subjective cost-measure weighting (Figure 1, links 5A + 5B) more frequently than it influences their subjective quality-measure weighting (Figure 1, link 7A). Because cost- and quality-measure weighting decisions by the same individual are not independent observations, we used a McNemar test with a continuity correction to compare proportions for dependent samples (Siegel 1956). The McNemar test compared four frequencies: 20 participants who changed the weight on both performance measures (Table 1, cells 2a + 2b), five who changed the weight on neither, seven who changed the weight on the cost but not the quality measure (5 + 7 = the 12 individuals in cell 2c), and zero who changed the weight on the quality but not the cost measure. The test result depended primarily on the relative magnitude of the last two groups (7 versus 0), in which participants changed the weight on one performance measure but not the other. The significant result of the McNemar test ($\chi^2 = 5.14$, $p < .05$) indicates that cost-measure precision is not equally likely to affect weights on cost measures and quality measures. Instead, changes in cost-measure precision lead to changes in cost-measure weights more often than to changes in quality-measure weights, providing support for H3.[13]

Hypotheses 4 and 5 make predictions about the use of error covariance in individuals' weighting decisions. Hypothesis 4 predicts that when the error covariance of cost and quality measures differs from the baseline, more individuals will choose different weights on both the cost and quality measures (link 5A and 5B, Figure 2) than will keep weights the same (links 1B + 2B). When error covariance differs (holding cost-measure precision constant), cost-measure weights differ for 88 percent of participants (28 of 32: Table 1, cells (3a + 3b)/32). Quality-measure weights differ for 97 percent participants (31 of 32:

---

[12] *Ex post* power calculations showing the probability of rejecting the null hypothesis at $\alpha = .05$, for an actual difference between conditions as large as the observed difference, indicated power of >.90 for H1 and H4, .42 for H2, and .81 for H5 (separate tests for cost- and quality-measure weights). The power of the McNemar Chi-square test used in H3 was .86.

[13] The seven participants who changed the cost-measure weight but not the quality-measure weight made decisions consistent with Figure 1: that is, they reached link 5A or 5B (cost-weight change) but stopped there rather than continue to link 7A (quality-measure weight change). The zero frequency in the last group used in the McNemar test (those who changed the quality-measure weight but not the cost-measure weight) indicates that no participants reached link 7A without passing through link 5A or 5B.

cells (4a + 4b)/32). Because H4 predicts that error covariance will influence individuals' weighting of *both* cost and quality measures, we consider only the 88 percent who change both weights as behaving consistently with the prediction. This proportion is a significant majority of the participants (88 percent > 50 percent, binomial test, $p < .01$). These results provide support for H4.

Hypothesis 5 predicts that directional errors in individuals' use of error covariance in cost- and quality-measure weighting (link 5B, Figure 2) will be more frequent than their failure to respond to differences in error covariance (links 1B + 2B). When error covariance differs from the baseline (holding cost-measure precision constant), 14 directional errors in cost-measure weighting decisions occur (Table 1, Panel A, cell 3b), compared to four errors of non-use (cell 3c). Similarly, nine directional errors in quality-measure weighting decisions occur (cell 4b), but only one error of non-use (cell 4c). When we examine the cost- and quality-measure weighting decisions separately, directional errors are significantly more frequent than non-use errors: 78 percent of cost-measure weighting errors (cell 3b/(3b + 3c)) are directional and 89 percent of quality-measure weighting errors (cell 4b/(4b + 4c)) are directional (binomial tests for equal frequency of directional and non-use errors, all $p < .02$). When we examine the two decisions together and compare only those participants with directional errors in weighting *both* measures (Panel B, row 5b, $n = 8$) and those with non-use errors in weighting *both* measures (row 5f, $n = 1$), directional errors are more common (89 percent > 50 percent, binomial test $p < .02$). These results are consistent with H5.

Supplementary Analysis

Two sets of supplementary data analysis provide evidence against potential alternative explanations for the results. Because the experimental task was relatively difficult, in spite of the simplifying effects of providing baselines and relevant parameter values, many participants might have failed to understand it completely. In addition, because of the within-subject manipulation and the relatively limited information provided to participants, the precision and error covariance manipulations could have been highly salient. Thus, in principle, demand effects could have accounted for participants' use of cost-measure precision and error covariance in choosing performance-measure weights, and random decisions due to lack of understanding could have accounted for the frequency of directional errors. An analysis of the exact magnitudes of participants' performance-measure weight changes, shown in Table 2, provides evidence inconsistent with random decision making by participants. A subsequent analysis of participants' responses to post-experiment questions provides evidence inconsistent with participants' decisions being driven by lack of understanding of the task.

Magnitude of Performance-Measure Weight Changes

The three panels in Table 2 show performance-measure weighting decisions for each of three plants: one where cost-measure precision differed from participants' baseline plant (Panel A); one where cost- and quality-measure error covariance differed from their baseline plant (Panel B); and one where both cost-measure precision and error covariance differed from their baseline plant (Panel C). Each panel of Table 2 presents four sets of weighting decisions, corresponding to the four baseline plants; thus, each of the four rows in a panel presents decisions made by a different subset of participants. For example, in Panel A, the first two rows show the decisions of participants who chose performance-measure weights for a plant with *higher* cost-measure precision than their baseline plant. Error covariance was held constant at the low level for participants whose decisions are shown in the first

TABLE 2
Optimal and Actual Magnitude of Differences in Performance Measure Weights When Cost-Measure Precision and Error Covariance Differ

Panel A: Difference in performance measure weights when cost-measure precision differs from the baseline plant and error covariance is held constant.

Cost-Measure Precision Compared to Baseline Plant	Error Covariance Constant	Optimal Difference in Cost-Measure Weights	Mean Actual Difference in Cost-Measure Weights		Optimal Difference in Quality-Measure Weights	Mean Actual Difference in Quality-Measure Weights		n
			Absolute	Signed		Absolute	Signed	
Higher	Low	125	31	14	54	16	5	9
Higher	High	215	59	33	137	31	6	7
Lower	Low	−125	82	−16	−54	23	1	9
Lower	High	−215	97	13	−137	55	−1	7

Panel B: Difference in performance measure weights when error covariance differs from the baseline plant and cost-measure precision is held constant.

Error Covariance Compared to Baseline Plant	Cost-Measure Precision Constant	Optimal Difference in Cost-Measure Weights	Mean Actual Difference in Cost-Measure Weights		Optimal Difference in Quality-Measure Weights	Mean Actual Difference in Quality-Measure Weights		n
			Absolute	Signed		Absolute	Signed	
Higher	Low	77	49	9	116	70	67	9
Higher	High	167	54	22	199	80	−63	9
Lower	Low	−77	53	9	−116	40	2	7
Lower	High	−167	128	−5	−199	82	−26	7

Panel C: Difference in performance measure weights when both cost-measure precision and error covariance differ from the baseline plant.

Error Covariance Compared to Baseline Plant	Cost-Measure Precision Difference from Baseline Plant	Optimal Difference in Cost-Measure Weights	Mean Actual Difference in Cost-Measure Weights		Optimal Difference in Quality-Measure Weights	Mean Actual Difference in Quality-Measure Weights		n
			Absolute	Signed		Absolute	Signed	
Lower	Higher	48	52	−14	−62	50	0	7
Lower	Lower	−292	124	−54	−253	78	−41	7
Higher	Lower	−48	109	23	62	80	64	9
Higher	Higher	292	53	23	253	62	50	9

Within each panel of Table 2, four sets of decisions are represented, corresponding to the four baseline plants. For example, in Panel A, the first two rows show the decisions of participants who chose performance-measure weights for a plant with *higher* cost-measure precision than their baseline plant. Error covariance was held constant at the low level for participants whose decisions are shown in the first row; and error covariance was held constant at the high level for participants whose decisions are shown in the second row. The last two rows of Panel A show the decisions of participants who chose performance-measure weights for a plant with *lower* cost-measure precision than their baseline plant. Panel B shows decisions when error covariance varied and cost-measure precision was held constant. Panel C shows decisions when both cost-measure precision and error covariance varied.

row, and error covariance was held constant at the high level (larger absolute value of negative covariance) for participants whose decisions are shown in the second row. The last two rows of Panel A show the decisions of participants who chose performance-measure weights for a plant with *lower* cost-measure precision than their baseline plant.

The third column of each panel shows how much participants should optimally have changed the cost-measure weight in response to a change in performance-measure attributes, and the fourth and fifth columns show mean actual changes in the cost-measure weight. Because (as expected) directional errors were common, negative and positive changes tended to cancel each other out. Therefore the mean signed changes in column 5 understate the extent to which individuals responded to performance-measure precision and error covariance. Column 4 in each panel of Table 2 reports mean absolute changes, to provide a better measure of the extent of individuals' responses to these performance-measure attributes.[14] Columns 6, 7, and 8 report optimal and mean actual (absolute and signed) changes in quality-measure weights.

A comparison of "optimal" with corresponding "mean actual absolute" and "mean signed" columns shows that participants' actual weights differed more from their baselines when optimal differences from baselines were larger. Using the signed means (which represent weaker mean responses than the absolute means), the Pearson correlation between the 12 optimal cost-measure weight differences shown in Table 1 and the mean actual signed cost-measure weight differences is .69 ($p < .05$); the corresponding correlation for quality-measure weight differences is .83 ($p < .05$). Thus, it appears that participants were not making random decisions.

Although decisions were not random, it could be argued that demand effects account for systematic behavior by participants, because the within-subjects manipulation made performance measurement attributes salient. This salience could have helped participants guess H1 (response to precision) and could have prompted them to respond accordingly. Hypothesis-guessing and demand effects with respect to the other four hypotheses are likely to be limited, however, for three reasons. First, participants could, in principle, have guessed H4 (response to error covariance), but salient manipulations of covariance in prior literature (Maines 1990; Lipe 1998) have not caused individuals to make use of covariance when variance (precision) was also manipulated, as it was in our experiment. Participants could have guessed that they were supposed to decide *which* of the information manipulations to use in the judgment task, and in prior studies they have often decided to use only error variance. Second, it seems unlikely that participants would have guessed H2, H3, and H5 (i.e., guessed that they were expected to change performance-measure weights in the wrong direction or fail to change quality-measure weights). Third, participants had no apparent motivation for making weighting errors, other than a belief that these were in fact correct decisions. The experimental instructions encouraged them to make economically optimal weighting decisions, and they knew that failing to do so would reduce their pay.

Post-Experiment Questions

We examined participants' responses to post-experiment questions in order to provide additional evidence on the reasoning that influenced their decisions and to eliminate the possibility that participants' decisions were driven by misunderstanding of important features of the experimental setting. For example, participants might have failed to notice that plant managers were risk-averse, might have believed the differences in cost-measure precision and error covariance were immaterial, might have believed that there was an implicit floor or ceiling on the total bonus that limited the decisions they could make, or might simply have failed to understand the information provided.

---

[14] Even absolute changes were smaller, on average, than optimal changes, perhaps indicating a tendency to anchor on the baseline and adjust insufficiently. We examined the absolute changes separately for participants who did and did not make directional errors, in order to determine whether insufficient adjustment and directional errors were related. On average, participants who did not make directional errors changed performance-measure weights more than participants who did make directional errors, but their changes were still less than the optimal amounts.

In the post-experiment questions, participants were asked to agree or disagree (on a nine-point scale) with a variety of possible reasons for their performance-measure weighting decisions.[15] We first tested whether patterns of response to the post-experiment questions were consistent with the reasoning proposed in Figures 1 and 2. Then we tested whether responses indicating this reasoning were more strongly associated with participants' decisions than responses indicating inattention or misunderstanding of the experimental materials. Table A2 shows the complete text of the post-experiment questions, grouped by the type of reasoning the questions were intended to capture.

For the questions about agency-theory reasoning and about beliefs that measurement error was irrelevant (questions 1–11), we used confirmatory factor analysis to determine whether responses to questions in each of the reasoning-type groups shown in Table A2 were correlated. (Note that the questions were not grouped by reasoning type in the instrument participants received.) We then classified participants into the following four categories, based on their agreement with one group of questions and disagreement with others. A participant was classified as agreeing (disagreeing) with a group of questions if the mean of his or her responses to the questions that loaded on the common factor was on the "agree" ("disagree") side of the scale midpoint. Nine percent of participants believed measurement error was irrelevant to performance-measure weighting decisions, 28 percent used agency reasoning as the basis for their decisions, 50 percent used the risk-return association without reasoning through its consequences, and 13 percent did not show clear patterns of agreement with one question group and disagreement with others.

(1) Irrelevance of measurement error. Five of the six questions measuring beliefs that measurement error was irrelevant to performance-measure weighting decisions (questions 1–4 and 6, Table A2) loaded on a common factor (Cronbach's $\alpha = .73$). Three (9 percent) of the 32 participants agreed with these questions, and disagreed with the agency-theory and risk-return questions. Consistent with their responses to the post-experiment questions, these three participants did not choose different performance-measure weights when precision and error covariance differed.

(2) Agency theory. Three of the four questions measuring agency-theory reasoning (questions 7–9, Table A2) loaded on a common factor (Cronbach's $\alpha = .75$). For both agency-theory reasoning and irrelevance of measurement error, questions about performance-measure error in general and about cost-measure precision in particular loaded on the common factor, while questions that addressed only error covariance (questions 5 and 10) did not. Nine (28 percent) of the participants agreed with the three agency questions that addressed uncertainty in general and precision in particular, and disagreed with the irrelevance of measurement error questions and the risk-return question. All nine made directionally correct responses to differences in cost-measure precision.

(3) Incomplete reasoning based on risk-return association. Sixteen (50 percent) of the participants agreed with question 11, which represented incomplete reasoning based on the risk-return association, and disagreed with the measurement-error irrelevance and agency-theory questions. All 16 made at least one directional error in performance-measure weighting decisions. Participants who made directional errors were significantly more likely to agree with the incomplete reasoning than were individuals who made directionally correct decisions (mean responses to question 11 in Appendix Table A2 for these two groups were 2.4 and 4.8, respectively; $t = 3.27$, $p < 0.006$).

---

[15] The post-experiment questions also included measures of analytic ability. Differences in participants' scores on the analytic-ability questions were not significantly correlated with the differences in decisions examined in the hypothesis tests (all $p > .05$).

(4) Other. Four (13 percent) of the participants agreed weakly with more than one of the three question groups (i.e., their mean response to the questions in a group was within half a point of the scale midpoint), so that they were not clearly classified in any of the three categories above.

To test whether participants' reasoning was consistent with that assumed in the hypothesis motivation or was driven by inattention to or misunderstanding of the information given, we selected sets of post-experiment questions that were relevant to each of the performance-measure weighting decisions participants made. For example, a question indicating whether participants had noticed plant managers were risk-averse was relevant to all of the performance-measure weighting decisions, while questions that indicated whether participants had misunderstood the error covariance information were only relevant to weighting decisions involving differences in error covariance. A 0–1 indicator of whether a particular decision error was made or not was used as the independent variable in a MANOVA, while the dependent variables were responses to the relevant post-experiment questions (agree or disagree with a particular line of reasoning, on a nine-point scale).

In summary, the supplementary analysis yields the following results.[16] First, inattention and misunderstanding (e.g., failure to notice that managers were risk-averse, belief that the parameter differences across plants were too small to matter, misunderstanding of error covariance) do not explain participants' decision errors, except for a marginally significant association between failure to use error covariance and failure to attend to the difference in error covariance across plants.

Second, the small number of participants who did *not* use cost-measure precision and error covariance tended to agree with explanations that similarity of job assignment and potential impact of cost and quality on firm value should determine performance-measure weights, and that error in performance measures was irrelevant.

Third, participants who used cost-measure precision and error covariance tended to agree with either agency reasoning (directionally correct decisions) or incomplete reasoning based on the risk-return association (directionally incorrect decisions). They did *not* agree with statements that explained their decisions on the grounds that lower precision and lower error covariance led to less fairness in performance measures. If participants had made performance-measure weighting decisions and chosen their responses primarily in order to present themselves in a favorable light, rather than to explain their actual decision processes, then the fairness explanation should have been significantly associated with their decisions. The absence of such an association indicates that *ex post* self-presentation concerns are not the primary driver of participants' responses to the post-experiment questions.

V. DISCUSSION

Many individuals who are not compensation experts evaluate their subordinates in organizations and, at least implicitly, choose weights on multiple performance measures in order to make evaluations that will motivate optimal performance by their subordinates. The mental-model theory used in this study allows us to predict and explain three ways in which nonexperts' reasoning about an agency problem corresponds to, or diverges from, the reasoning underlying the formal agency-theory model. First, although individuals' judgments and decisions tend not to be influenced by precision and error covariance in many other settings (e.g., Nisbett 1993; Griffin and Tversky 1992; Lipe 1998; Maines 1990), performance-measure weighting decisions in our experimental agency setting are influenced by precision and error covariance because individuals can substitute controllability for these statistical attributes.

---

[16] Complete analyses are available from the authors on request.

Second, subjective weights on a particular performance measure are more likely to be influenced by the error in *that* measure than by the error in *other* measures. Individuals tend to consider performance measures one at a time, focusing on the direct effect of each measure's error on its own weight, rather than considering performance measures as a portfolio in which the error in one measure can indirectly affect the value of other measures. Third, many individuals make decisions directionally opposite to those predicted by agency theory because they associate higher risk with higher return and try to include the higher return in the performance-measure weight.

This study is subject to the usual limitations of experimental research. Our participants were a relatively homogeneous group, and the information provided to them was exactly what they needed for their decisions. In natural settings, characteristics of the decision makers and the information available to them can differ considerably, and not all combinations of decision maker and information characteristics will yield outcomes similar to those we report. It should be noted, however, that directionally incorrect, risk-increasing decisions do not appear to be an artifact of this experiment. A very different experiment using a multiperiod experimental labor market with participants in both principal and agent roles, with principals free to set both base pay and bonus weights, finds that some principals repeatedly offer riskier contracts with higher performance-measure weights when the performance measure is less precise (Shields and Waller 1988). Directionally incorrect decisions also do not appear to be confined to student participants in experiments, as shown by Bloom's (1999) argument in the compensation practitioner literature that incentive pay should be more performance-sensitive (weights on performance measures should be higher) when risk is higher.

The results of this experiment identify two areas for future research. One is a more complete account of individuals' mental models of performance-measure weighting for purposes of incentive compensation. This paper uses agency theory as a starting point and identifies points at which individuals' mental models can be expected to diverge from the agency model, but it does not identify complete alternative (nonagency) models or predict the distribution of these models across sub-populations with different experience and knowledge.

A second area for future research is how individuals change their performance-measure weighting decisions in response to feedback over time. The suboptimal decisions participants made in this single-trial experiment are likely to be modified over time, but initial decision errors are costly. Moreover, initial errors can exert a negative influence on subsequent learning. Krishnan et al. (2002) show in a different accounting setting that directionally incorrect initial decisions significantly slow the learning process. Individuals make directionally incorrect initial decisions because their belief about (or mental model of) the setting is incorrect. They then learn less from outcome feedback because it is inconsistent with their mental model and is treated as noise rather than information. In natural environments, outcome feedback about incentive compensation decisions under differing risk conditions can be difficult to interpret because differences in risk are correlated with differences in other factors such as competition (Raith 2003) and the delegation of decision rights

(Prendergast 2002). These difficulties can be mitigated or exacerbated by factors such as the frequency and type of feedback, the complexity or uncertainty of the economic environment, the availability of successful examples in similar organizations that can be imitated without extensive analysis, and the knowledge, ability, and motivation of the individuals who make performance-measure weighting decisions.

APPENDIX

Table A1 shows a baseline version of the information participants received. The parameter values in Table A1 are linked to the Feltham and Xie (1994) model as follows. Performance measures (here cost and quality, y_1 and y_2, respectively) are modeled as linear functions of a plant manager's cost-reduction (a_1) and defect-reduction (quality improvement) (a_2) actions:

$$y_1 = \mu_{11}a_1 + \mu_{12}a_2 + \varepsilon_1, \text{ and} \tag{1}$$

$$y_2 = \mu_{21}a_1 + \mu_{22}a_2 + \varepsilon_2. \tag{2}$$

Each action is weighted by a sensitivity parameter (μ_{ij}) that indicates the effect of a manager's action j on performance measure i. An error term (ε_i) represents effects on the performance measure i other than the plant manager's actions. The variances and covariances of these ε_i's are represented in a matrix Σ, with the diagonal terms indicating precision in each individual measure and the off-diagonal terms indicating error covariance. The principal's gross payoff (x) is also affected by the two types of managerial actions:

$$x = b_1a_1 + b_2a_2 + \varepsilon_x, \tag{3}$$

where b_j = effect of a manager's action j on the principal's gross payoff (a component of congruity) and ε_x = error term representing effects of other influences on the principal's gross payoff.

Optimal performance-measure weights are calculated using the parameters given in Panel A and equation (7) in Feltham and Xie (1994):

$$\mathbf{v}^+ = [\boldsymbol{\mu}\boldsymbol{\mu}^t + \mathrm{r}\,\boldsymbol{\Sigma}]^{-1}\,\boldsymbol{\mu}\mathbf{b}, \tag{4}$$

where:

$\mathbf{v}^+$ = a vector of incentive weights;
$\boldsymbol{\mu}$ = matrix of sensitivity coefficients (expected change in cost and quality measures associated with a one-unit change in cost-reducing and quality-improvement effort);
r = plant manager's absolute risk aversion (value assumed to be 1, as in Feltham and Xie's [1994, Table 1] numerical example);
$\boldsymbol{\Sigma}$ = variance-covariance matrix representing precision in cost and quality measures and error covariance of the cost and quality measures; and
$\mathbf{b}$ = vector of coefficients indicating the effects of the plant manager's cost-reducing and quality-improvement efforts on the principal's gross payoff.

Using Equation (4) above and the parameters provided in the experimental materials, optimal performance-measure weights for the four plants are as follows ("high" covariance means a more negative error covariance):

	Cost-Measure Weight	Quality-Measure Weight
Plant 1: Low precision, low covariance	318	137
Plant 2: Low precision, high covariance	395	253
Plant 3: High precision, low covariance	443	191
Plant 4: High precision, high covariance	610	390

TABLE A1
Experimental Instrument: A Baseline Version

Participants received the material shown below, *without the descriptions in parentheses* that identify information items with terms in the Feltham and Xie (1994) model. Participants also received three other similar pages, in which the precision of the cost measure (either 0.20 or 0.14) and the error covariance (either –0.007 or –0.02) were varied, all other information was identical, and the optimal annual bonus amounts were left blank, to be filled in by participants.

Plant 1

At this plant, the denominator volume used to calculate actual full unit product cost is *actual annual production volume*. Because the plant manager has very little influence over actual production volume, the use of this denominator volume increases the fluctuations in actual full unit product cost that the plant manager cannot control. [*Alternative method, manipulated between subjects:* At this plant, the denominator volume used to calculate the fixed overhead portion of actual full unit product cost is *practical capacity*. Practical capacity is the corporate industrial engineering department's estimate of the highest volume of good production that is realistically possible for a year. This department's estimates have proven to be highly accurate in the past. The use of practical capacity as the denominator volume means that actual full unit product cost is unaffected by volume changes the plant manager cannot control.] Within the relevant range of production volume and managerial activity:

Expected increase in firm value if plant manager implements one unit of cost-decreasing action (*element of congruity:* b_1)	\$120.00
Expected increase in firm value if plant manager implements one unit of defect-decreasing action (*element of congruity:* b_2)	\$30.00
Expected decrease in actual full unit product cost if plant manager implements one unit of cost-decreasing action (*sensitivity:* μ_{11})	\$0.20
Expected increase in defect measure if plant manager implements one unit of cost-decreasing action (*sensitivity:* μ_{21})	0.05
Standard deviation (uncertainty) of actual full unit product cost, due to factors beyond plant manager's control (*precision of cost measure: square root of* Σ_{11})	\$0.20
Expected decrease in defect measure if plant manager implements one unit of defect-decreasing action (*sensitivity:* μ_{22})	0.20
Expected increase in actual full unit product cost if plant manager implements one unit of defect-decreasing action (*sensitivity:* μ_{12})	\$0.05
Standard deviation (uncertainty) of defect measure, due to factors beyond manager's control (*precision of cost measure: square root of* Σ_{22})	0.14
Relation between uncontrollable influences on cost and defect measures (*error covariance:* Σ_{12} *and* Σ_{21})	−0.007

Based on this information, senior managers have decided on the following bonus plan:

Optimal annual bonus for each *\$1.00* of decrease in actual full unit product costs	\$318.00
Optimal annual bonus for each *one-point* decrease in the defect measure	\$137.00

TABLE A2
Post-Experiment Questions*

Reasons for believing cost-measure precision and error covariance were irrelevant to performance-measure weighting decisions.

1. I designed the same bonus plans for all of the managers at each type of plant because I do not believe that different people should be paid differently for the same job assignment.
2. I designed the same bonus plans for all of the managers at each type of plant because the goal of the bonus plan was to motivate managers to increase firm value. What managers could do to increase firm value was the same at all plants of a given type, so the bonuses should be the same. The other information provided was not relevant to my bonus-plan decisions.
3. I believe that, with the information available in the simulation, the *best* bonus plans that could be designed would motivate managers to decrease costs just as much at the plants with a *more* uncertain cost measure as at the plants with a *less* uncertain cost measure.
4. It [cost precision] had no effect because I believe that dealing with uncertainty is part of a manager's job. Managers should accept the fact that bonuses are uncertain and not expect the bonus plans to be adjusted for differences in uncertainty.
5. It [error covariance] had no effect because it did not affect the value of a manager's actions.
6. It [cost-measure precision] had no effect [on the quality-measure weight] because a difference in the uncertainty of the cost measure did not change the defect measure or the value of defect-decreasing actions.

Agency-Theory Reasoning

7. I decided to offer a smaller bonus for cost decreases when the uncertainty was higher, because then actual full unit cost was not as informative about the manager's actions.
8. I decided to offer a smaller bonus for cost decreases when the uncertainty was higher, because motivating large cost decreases was too expensive when the manager had to be compensated for being exposed to more uncertainty. When the uncertainty was higher, the bonus plan could not be used to motivate as much cost-improvement action.
9. I decided to offer a smaller bonus for defect decreases when the uncertainty of the cost measure was high, because I offered a smaller bonus for cost. If I kept the bonus for defect decreases high, managers would shift too much effort from cost decreases to defect decreases and thus increase production cost.
10. I decided to offer larger bonuses for both measures when the relation [between uncontrollable influences on performance measures] was more negative, because then the effects of uncontrollable events tended more to cancel each other out, reducing the net effect of these events and reducing the uncertainty in managers' bonuses.

Incomplete Reasoning Based on Risk-Return Association

11. I decided to offer a larger bonus for cost decreases when the uncertainty was higher, because the managers were risk-averse. With higher uncertainty, I would have to pay them more to motivate the same amount of effort.

Attention and Understanding Errors and Other Reasoning

12. The managers for whom you designed annual bonus plans were [choose one]: risk-averse, risk-neutral, risk-seeking, don't know. [Coded as 1 if correct, 0 if incorrect answer.]
13. Are the managers motivated by the incremental annual bonus they will receive for higher performance? [choose one] Yes, no, don't know. [Coded as 1 if correct, 0 if incorrect answer.]
14. I decided to offer a smaller bonus for cost decreases when the uncertainty was higher, because it was not fair to have so much of the manager's compensation depend on the cost measure when he or she has less influence over this measure.

15. I decided to offer a smaller bonus for defect decreases when the uncertainty of the cost measure was high, because I offered a larger bonus for cost decreases and I did not want to increase the total bonus too much.
16. I decided to offer a larger bonus for defect decreases when the uncertainty of the cost measure was high, because I offered a smaller bonus for cost decreases and I did not want to decrease the total bonus too much.
17. I decided to offer a larger bonus for defect decreases when the uncertainty of the cost measure was high, because defects became a relatively better measure when the uncertainty in the cost measure increased.
18. I decided to offer larger bonuses for both measures when [error covariance] was more negative, because then managers experienced more uncertainty about their bonuses.
19. I decided to offer smaller bonuses for both measures when the relation was more negative, because then neither measure was a very accurate indicator of managers' actions.
20. I decided to offer more unequal bonuses for the two measures for both measures when the relation was more negative, because then the measures were more redundant and one provided little additional information beyond the information provided by the other.

The following explanations were suggested separately for cost-measure precision and error covariance.

21. It had no effect because I did not notice it.
22. It had no effect because the difference was not big enough to matter.
23. It had no effect because I was not sure what effect it should have.

Post-experiment questions also asked participants for self-ratings of their motivation and effort.

---

*Responses were on a scale from 1 (agree strongly) to 9 (disagree strongly), except for questions 12 and 13. Questions were *not* grouped by line of reasoning in the experimental instrument; instead, they were grouped by decision (cost-measure weighting decision when cost precision changed, quality-measure weighting decision when cost-measure precision changed, and weighting of both measures when error covariance changed). Questions capturing different lines of reasoning (and errors in attention and understanding) were intermingled within each decision-related group.

REFERENCES

Atkinson, T., R. Kaplan, and S. M. Young. 2004. *Management Accounting*. Fourth edition. Upper Saddle River, NJ: Prentice Hall.

Baker, G., R. Gibbons, and K. J. Murphy. 1994. Subjective performance measures in optimal incentive contracts. *Quarterly Journal of Economics* 109 (4): 1124–1156.

Banker, R. D., and S. M. Datar. 1989. Sensitivity, precision, and linear aggregation of signals for performance evaluation. *Journal of Accounting Research* 27 (1): 21–39.

———, G. Potter, and D. Srinivasan. 2000. An empirical investigation of an incentive plan that includes nonfinancial performance measures. *The Accounting Review* 75 (1): 65–92.

———, S. Devaraj, R. Schroeder, and K. Sinha. 2002. Performance impact of the elimination of direct labor variance reporting: A field study. *Journal of Accounting Research* 40 (4): 1013–1036.

Bloom, M. 1999. The art and context of the deal: A balanced view of executive incentives *Compensation and Benefits Review* 31 (1): 25–31.

Bloomfield, R. 1997. Strategic dependence and the assessment of fraud risk: A laboratory study. *The Accounting Review* 72: 517–538.

Bonner, S. E., and B. Lewis. 1990. Determinants of auditor expertise. *Journal of Accounting Research* 28 (Supplement): 1–20.

———, J. S. Davis, and B. R. Jackson. 1992. Expertise in corporate tax planning: The issue identification stage. *Journal of Accounting Research* 30 (Supplement): 1–36.

———, and P. L. Walker. 1994. The effects of instruction and experience on the acquisition of auditing knowledge. *The Accounting Review* 69 (1): 157–178.

Borgida, E., and R. E. Nisbett. 1977. The differential impact of abstract versus concrete information on decisions. *Journal of Applied Social Psychology* 7: 258–271.

Brickley, J. A., C. W. Smith, and J. L. Zimmerman. 1996. *Organizational Architecture: A Managerial Economics Approach*. Chicago, IL: Irwin.

Buchheit, S. 2003. Reporting the cost of capacity. *Accounting, Organizations and Society* 28 (6): 549–566.

———. 2004. Fixed cost magnitude, fixed cost reporting format, and competitive pricing decisions: Some experimental evidence. *Contemporary Accounting Research* 21 (1): 1–23.

Bushman, R. M., R. J. Indjejikian, and A. Smith. 1995. Aggregate performance measures in business unit manager compensation: The role of intrafirm interdependencies. *Journal of Accounting Research* 33 (Supplement): 101–134.

Chingos, P. T., and Peat Marwick, eds. 1997. *Paying for Performance: A Guide to Compensation Management*. New York, NY: Wiley

Choudhury, N. 1986. Responsibility accounting and controllability. *Accounting and Business Research* 16 (Summer): 189–198.

Datar, S., S. C. Kulp, and R. Lambert. 2001. Balancing performance measures. *Journal of Accounting Research* 39 (1): 75–92.

Davila, T., and R. Simons. 1997. *Citibank: Performance Evaluation*. Harvard Business School Case #9-198-048. Boston, MA: Harvard Business School Publishing.

Dearman, D., and M. D. Shields. 2005. Reducing accounting fixation: Determinants of cognitive adaptation to a variation in accounting method. *Contemporary Accounting Research* 22 (2): 351–384.

Diehl, E., and J. D. Sterman. 1995. Effects of feedback complexity on dynamic decision making. *Organizational Behavior and Human Decision Processes* 62 (2): 198–215.

Feltham, G., and J. Xie. 1994. Performance measure congruity and diversity in multi-task principal/agent relations. *The Accounting Review* 69 (3): 429–453.

Gibbs, M., K. A. Merchant, W. Van der Stede, and M. E. Vargus. 2004. Performance measure properties and incentives. Working paper, University of Southern California.

Griffin, D., and A. Tversky. 1992. The weighing of evidence and the determinants of confidence. *Cognitive Psychology* 24: 411–435.

Heath, C. 1999. On the social psychology of agency relationships: Lay theories of motivation overemphasize extrinsic incentives. *Organizational Behavior and Human Decision Processes* 78 (1): 25–62.

Hemmer, T. 1996. On the design and choice of "modern" management accounting measures. *Journal of Management Accounting Research* 9: 87–116.

Heneman, T. 2001. *Business-Driven Compensation Policies: Integrating Compensation Systems with Corporate Business Strategies*. New York, NY: Amacom.

Horngren, C., S. Datar, and G. Foster. 2006. *Cost Accounting: A Managerial Emphasis*. Upper Saddle River, NJ: Prentice Hall.

Ittner, C. D., D. F. Larcker, and M. V. Rajan. 1997. The choice of performance measures inannual bonus contracts. *The Accounting Review* 72 (2): 231–256.

———, and ———. 1998. Innovations in performance measurement: Trends and research implications. *Journal of Management Accounting Research* 10: 205–238.

———, ———, and M. Meyer. 2003. Subjectivity and the weighting of performancemeasures: Evidence from a balanced scorecard. *The Accounting Review* 78 (3): 725–758.

Kahneman, D., and S. Frederick. 2002. Representativeness revisited: Attribute substitution in intuitive judgment. In *Heuristics and Biases: The Psychology of Intuitive Judgment*, edited by T. Gilovich, D. Griffin, and D. Kahneman, 49–81. Cambridge, U.K.: Cambridge University Press.

———. 2003. A perspective on judgment and choice: Mapping bounded rationality. *American Psychologist* 58 (9): 697–720.

Kaplan, R. S. 1994. Flexible budgeting in an activity-based costing framework. *Accounting Horizons* 8 (2): 104–109.

Krishnan, R., J. Luft, and M. D. Shields. 2002. Competition and cost accounting: Adapting to changing markets. *Contemporary Accounting Research* 19 (2): 271–302.

Lipe, M. 1998. Individual investors' risk judgments and investment decisions: The impact of accounting and market data. *Accounting, Organizations and Society* 23 (7): 625–640.

Maines, L. 1990. The effect of forecast redundancy on judgments of a consensus forecast's expected accuracy. *Journal of Accounting Research* 28 (Supplement): 29–47.

March, J. G., and Z. Shapira. 1987. Managerial perspectives on risk and risk taking. *Management Science* 33 (11): 1404–1418.

Markman, A. B. 1999. *Knowledge Representations*. Mahwah, NJ: Lawrence Erlbaum.

———, and D. Gentner. 2001. Thinking. *Annual Review of Psychology* 52: 223–247.

Merchant, K. A. 1985. *Control in Business Organizations*. Boston, MA: Pitmans.

Nelson, M., R. Bloomfield, J. W. Hales, and R. Libby. 2001. The effect of information strength and weight on behavior in financial markets. *Organizational Behavior and Human Decision Processes* 86 (2): 168–196.

Nisbett, R., D. H. Krantz, C. Jepson, and Z. Kunda. 1983. The use of statistical heuristics in everyday inductive reasoning. *Psychological Review* 90: 339–363.

———. 1993. *Rules for Reasoning*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Niven, P. R. 2002. *Balanced Scorecard Step by Step: Maximizing Performance and Maintaining Results*. New York, NY: Wiley.

Prendergast, C. 2002. The tenuous trade-off between risk and incentives. *The Journal of Political Economy* 110 (5): 1071–1102.

Raith, M. 2003. Competition, risk, and managerial incentives. *The American Economic Review* 93 (4): 1425.

Santovec, M. L. 2001. Sharing the wealth. *Credit Union Management* 26 (5): 42–45.

Shields, M. D., and W. S. Waller. 1988. A behavioral study of accounting variables in performance-incentive contracts. *Accounting, Organizations and Society* 13 (6): 581–595.

Siegel, S. 1956. *Nonparametric Statistics for the Behavioral Sciences*. New York, NY: McGraw-Hill.

Sterman, J. D. 1989. Misperceptions of feedback in dynamic decision making. *Organizational Behavior and Human Decision Processes* 43: 301–335.

Tversky, A., and D. Kahneman. 1971. Belief in the law of small numbers. *Psychological Bulletin* 76 (2): 105–110.

Wilks, T. J., and M. F. Zimbelman. 2004. Decomposition of fraud risk assessments and auditors' sensitivity to fraud cues. *Contemporary Accounting Research* 21 (3): 719–745.

Zimmerman, J. L. 2006. *Accounting for Decision-Making and Control*. New York, NY: McGraw-Hill Irwin.

THE ACCOUNTING REVIEW
Vol. 80, No. 4
2005
pp. 1193–1209

The Role of Biased Earnings Guidance in Creating a Healthy Tension between Managers and Analysts

Brian Mittendorf
Yale University

Yun Zhang
Duke University

ABSTRACT: Analysts and the managers of firms they track have both come under fire in recent years. In particular, managers are accused of using earnings guidance to exert undue influence on analyst forecasts. This paper analyzes optimal incentive contracts that take into account the interaction between analysts and firm managers. In our setting, biased earnings guidance is a natural consequence of contract design. The bias serves to create enough uncertainty so as to motivate the analyst and, thus, may not necessarily be the scourge suggested by conventional wisdom.

Keywords: *analyst forecasts; biases; earnings guidance; incentives.*

I. INTRODUCTION

The interplay between managers and the analysts who follow them has recently come under scrutiny. Analysts are often accused of being pawns in an earnings guidance game, succumbing to manipulation by managers bent on boosting perceived performance. The apparent result is to undermine the financial reporting process. In short, while the aim of reporting is to clarify a company's financial position, "[e]arnings guidance often obfuscates" (Barsky 2002).

This paper examines analyst-manager interactions from a contracting perspective and shows that biased earnings guidance could play a more positive role in incentives than conventional wisdom suggests. In order to best exploit all potential information sources in contracting with a manager, a firm's owner benefits from less than fully revealing earnings guidance. Bias in guidance keeps analysts on their toes, thereby encouraging them to conduct research that provides an independent assessment of firm performance.

To elaborate, we study a principal-agent model in which the agent (manager) exerts unobservable effort and obtains private information about the firm's resulting economic

---

We thank Rick Antle, Anil Arya, Tim Baldenius, Qi Chen, Jonathan Glover, Gans Narayanamoorthy, Phillip Stocken, Shyam Sunder, Jacob Thomas, Mohan Venkatachalam, Amir Ziv, workshop participants at Yale University and the 2004 AAA Annual Meeting, and especially Madhav Rajan (editor) and two anonymous referees for helpful comments.

Editor's note: This paper was accepted by Madhav Rajan.

Submitted July 2004
Accepted April 2005

earnings. In contracting with the manager, the principal (owner) can rely not only on the manager's disclosures, but also on forecasts issued by a third-party analyst.

The fact that the manager privately observes economic earnings introduces a demand for the analyst as an independent information intermediary. In particular, the owner makes use of an early disclosure (guidance) from the manager. The manager's guidance is held in check by the threat of punishment in the event of a discordant analyst report. The analyst's research effort is also influenced by the manager's guidance. Seeking a best-guess estimate of earnings, the analyst conducts research only if the guidance is not too revealing.

In the presence of such mutual discipline, the managerial incentive contract weighs the motivations of both the manager and analyst. On the one hand, the analyst's report is used to hold the manager's guidance in check. On the other hand, bias in guidance is used to encourage research effort by the analyst. The optimal managerial contract induces just enough bias in guidance to encourage the analyst to investigate. This bias takes the form of occasional overstatement. In equilibrium, the analyst rationally foresees this behavior and follows up only favorable guidance with additional (but imperfect) research. Such one-sided investigation can then lead to biases in the subsequent analyst forecast.

By focusing on the effects of earnings guidance from a labor market perspective, this paper provides a contrast to the usual capital market perspective of guidance. The broader point of the paper is not that labor market considerations are the sole factor in analyst-manager interactions, but that such considerations can introduce a mitigating force in the typical view of the "earnings guidance game." The implication is that fully revealing disclosures may not necessarily be paramount when the multiple roles of financial disclosures are in view. This is reminiscent of the trade-off between the decision-making and decision-control uses of accounting (Zimmerman 2000).[1]

The extant literature has examined varied facets of analyst incentives, including temptations to herd and group dynamics (e.g., Welch 2000), career concerns (e.g., Hong et al. 2000), the desire to cultivate relationships with management (Francis and Philbrick 1993; Lim 2001), and the pressure to parlay forecasts into revenues for other lines of business (e.g., Hayes 1998). This paper abstracts away from these aspects of analyst incentives to focus on an analyst's motivation to conduct research in the presence of earnings guidance within an optimal contracting framework.

In our setting, the owner exploits a manager's communication of private information in contracting. The usefulness of managerial reports comes due to the disciplinary influence of a second information source, as in Dye (1983) and Gigler and Hemmer (2001), among others. Here, however, the manager's report may also influence the second information source. This reciprocal influence requires the owner to introduce bias in the manager's report to balance the parties' incentives.

The owner's penchant for biased earnings guidance can be attributed to a breakdown in the revelation principle (Arya et al. 1998). In this setting, a breakdown occurs due to the owner's inability to contract directly with the analyst, as well as the lack of private communication channels. The latter proves particularly critical, since the analyst observes the manager's report and can condition her actions on it.[2]

---

[1] In a similar vein, Demski (1998) shows that the pattern of realized earnings serves a useful incentive role; this role, in turn, may justify earnings smoothing. Here, we demonstrate that the pattern of guidance and analyst forecasts can serve a useful incentive role that may justify the presence of biases therein.

The benefit of biased disclosures in governing analyst-manager interactions has analogs in the auditing and tax-compliance literatures. These streams of literature highlight how striking a balance in incentives between parties entails the participants keeping each other guessing (e.g., Baiman et al. 1987; Fellingham and Newman 1985; Sansing 1993). In this paper, sequential disclosures play a key role. Such sequential interaction typically occurs "behind closed doors" in auditing negotiation and taxation disputes and only the final agreed-upon figure is publicized. In contrast, managerial guidance and analyst forecasts play out in the public arena. As a result, the evolution of analyst-manager interactions may be particularly suited for inclusion in incentive arrangements (for evidence of such inclusion see, e.g., Matsunaga and Park 2001).

This paper proceeds as follows. In Section II, we present the model set up. Section III derives equilibrium solutions, addresses tacit collusion concerns, and discusses implications. We conclude in Section IV.

II. MODEL

A firm owner (principal) hires a manager to conduct the firm's operations. The manager undertakes productive effort, e, $e \in \{e_L, e_H\}$, $e_H > e_L = 0$. After completing his effort, the manager privately observes the firm's economic earnings. Economic earnings are denoted x, $x \in \{x_L, x_H\}$, $x_H > x_L$. The common knowledge probability $x = x_i$ given e is $\Pr(x_i|e)$, $1 > \Pr(x_H|e_H) > \Pr(x_H|e_L)$. Having learned the firm's economic earnings, the manager can issue an initial disclosure, or earnings guidance, predicting the impending observation of accounting earnings.

Accounting earnings, z, $z \in \{z_L, z_H\}$, provide a verified (audited) signal of the privately observed economic earnings, but may do so with some error. In particular, the probability $z = z_m$ given $x = x_i$ is denoted $\Pr(z_m|x_i)$: $\Pr(z_i|x_i) = \rho$, $1/2 < \rho \leq 1$. That is, ρ reflects the accuracy with which the accounting earnings capture the latent economic earnings. Denote the earnings guidance issued by the manager by $\hat{z}$, $\hat{z} \in \{z_L, z_H\}$.

An analyst also follows the firm's performance. Upon observing the manager's guidance, the analyst can conduct further market research and issue a forecast. Her market research effort is denoted a, $a \in \{a_L, a_H\}$, $a_H > a_L = 0$. Market research provides the analyst a private signal, y, $y \in \{y_L, y_H\}$, upon which she can base the forecast, f, $f \in \{z_L, z_H\}$. Note that f, z, and $\hat{z}$ share the same support.

The probability of receiving signal y_j given x_i and research effort a is $\Pr(y_j|x_i, a)$. Assume a_L yields an uninformative signal, i.e., $\Pr(y_L|x_i, a_L) = \Pr(y_H|x_i, a_L) = 1/2$. Diligent research results in a more accurate (but noisy) signal: $1 > \Pr(y_i|x_i, a_H) > 1/2$. Subsequent to the analyst's forecast, the firm's accounting earnings are realized.

---

[2] If private communication channels could be used, then the owner could exploit the best of both worlds by receiving fully revealing disclosures while keeping the analyst in the dark. However, public earnings guidance can offer other (unmodeled) benefits such as providing timely information to a diverse body of constituents (e.g., shareholders, debtholders). Regulation FD cemented this view by requiring that guidance take a public form. As such, our analysis takes as given the need to publicly release earnings guidance, and studies its implications.

To highlight the incentive problem, assume the firm wishes to motivate high managerial effort (if possible). The firm can offer a contract that stipulates payments, s, conditioned on the earnings guidance as well as the analyst's forecast, i.e., $s = s(\hat{z}, f)$.[3]

The timeline of events is summarized in Figure 1.

The manager is risk- and effort-averse. His utility function is $u(s) - e$, where $u(s)$ is the manager's utility of the monetary payment from the principal and is continuous, $u'(s) > 0$, $u''(s) < 0$. The variable e represents the disutility of supplying managerial effort. The analyst is risk-neutral. She is averse to both effort and forecast errors. In particular, the analyst's utility is $-a - L(f, z)$, where $L(z_n, z_j) = L$ if $n \neq j$ and 0 otherwise.[4] The variable a is the disutility of research effort, and L reflects potential reputation damage to the analyst when her forecast is inconsistent with accounting earnings.

The manager's strategy consists of the chosen effort, e, and his reporting behavior. In particular, the manager's strategy for earnings guidance is $r_k(x)$, where $r_k(x)$ denotes the probability of reporting $\hat{z} = z_k$ given x, his information at the time. Since $r_L(x) = 1 - r_H(x)$, we can, without loss of generality, restrict attention to $r_H(x)$. The analyst's strategy is to choose market research effort (conditioned on guidance) and her forecast reporting behavior. Denote these strategy elements by $a(\hat{z})$ and $f(\hat{z}, y)$, respectively.

Given an agreed-upon compensation contract, the manager's expected utility is denoted $U(e, r_H(x), \bar{a}(\hat{z}), \bar{f}(\hat{z}, y))$, where $(\bar{a}(\hat{z}), \bar{f}(\hat{z}, y))$ represents the manager's conjecture about the analyst's strategy:

$$U(e, r_H(x), \bar{a}(\hat{z}), \bar{f}(\hat{z}, y)) = \sum_{i,j,k,m} \Pr(x_i|e) r_k(x_i) \Pr(y_j|x_i, \bar{a}(z_k)) \Pr(z_m|x_i) u(s(z_k, \bar{f}(z_k, y_j))) - e.$$

Similarly, the analyst's expected utility is $V(\bar{e}, \bar{r}_H(x), a(\hat{z}), f(\hat{z}, y))$, where $(\bar{e}, \bar{r}_H(x))$ represents the analyst's conjecture about the manager's strategy:

FIGURE 1
Timeline of Events

Contract is signed.	Manager chooses effort, e, and observes economic earnings, x.	Manager issues earnings guidance, $\hat{z}$.	Analyst performs research, a, privately observes a signal, y, and issues a forecast, f.	Accounting earnings, z, are realized.	Manager is paid according to the contract.

---

[3] Conspicuously absent from the contract is accounting earnings. In order to emphasize the main forces of the model and allow for closed-form solutions to the optimal contract, we initially assume that accounting earnings are not used in contracting. However, the assumption is relaxed in a subsequent section, which shows that the key results can be generalized under mild conditions.

[4] Naturally, the principal is unable to write a contract with the analyst and must rely on the analyst's existing incentives. We assume the analyst's accuracy is measured relative to accounting earnings. The "Results" section also discusses the scenario in which analyst accuracy is tracked relative to economic earnings. Mikhail et al. (1999) find evidence consistent with our assumption that analysts are rewarded for forecast accuracy.

$$V(\bar{e}, \bar{r}_H(x), a(\hat{z}), f(\hat{z}, y)) = -\sum_{i,j,k,m} \Pr(x_i|\bar{e})\bar{r}_k(x_i)\Pr(y_j|x_i, a(z_k))\Pr(z_m|x_i)$$
$$[L(f(z_k, y_j), z_m) + a(z_k)].$$

The principal's contracting problem is summarized in Program (P). The principal's goal is to write a contract that minimizes expected compensation while motivating the desired manager and analyst strategies. In the program, the individual rationality constraint, (IR^M), requires the contract provide the manager his reservation utility, $\bar{U}$.[5] The incentive compatibility constraints, (IC^M) and (IC^A), ensure the manager and analyst strategies are best-response pairs and thus constitute a Bayes-Nash equilibrium.[6]

Program (P)

$$\underset{s(\hat{z},f), r_H(x), a(\hat{z}), f(\hat{z},y)}{\text{Min}} \sum_{i,j,k,m} \Pr(x_i|e_H)r_k(x_i)\Pr(y_j|x_i, a(z_k))\Pr(z_m|x_i)s(z_k, f(z_k, y_j))$$

s.t.

$$U(e_H, r_H(x), a(\hat{z}), f(\hat{z}, y)) \geq \bar{U} \qquad (IR^M)$$

$$U(e_H, r_H(x), a(\hat{z}), f(\hat{z}, y)) \geq U(\tilde{e}, \tilde{r}_H(x), a(\hat{z}), f(\hat{z}, y)) \ \forall \tilde{e}, \tilde{r}_H(x) \qquad (IC^M)$$

$$V(e_H, r_H(x), a(\hat{z}), f(\hat{z}, y)) \geq V(e_H, r_H(x), \tilde{a}(\hat{z}), \tilde{f}(\hat{z}, y)) \ \forall \tilde{a}(\hat{z}), \tilde{f}(\hat{z}, y) \qquad (IC^A)$$

It will prove convenient to solve (P) in terms of utile payments, $u(s(\hat{z}, f))$. For ease of notation in the remainder of the paper, denote $u(s(\hat{z} = z_k, f = z_n))$ by u_{kn}, $\Pr(y_i|x_i, a_H)$ by p_H, and $\Pr(x_H|e_r)$ by q_r. Also, denote the solution to (P) by $(u^*_{kn}, r^*_H(x), a^*(\hat{z}), f^*(\hat{z}, y))$.

III. RESULTS

In essence, the setting fuses three incentive problems: (1) a manager's incentive to exert effort, (2) the manager's reporting incentives, and (3) the incentives of a third-party analyst. To build up to the optimal contract in the presence of all three problems, first consider contracting in two less stringent benchmark cases.

Managerial Moral Hazard Problem

Consider first the case where only the manager's effort incentives are of concern. That is, assume the principal can directly contract on the privately observed variables x, a, and y. With x freely at the principal's disposal, the analyst's effort (a) and the ensuing signal (y) are of no use (each only provide noisy confirmation of the manager's information). In this case, the setting corresponds to a standard moral hazard problem, with (IR^M) and (IC^M) determining the payments. Solving the incentive constraints yields a utile payment of $\bar{U} - \frac{e_H q_L}{q_H - q_L}$ if $x = x_L$ and a utile payment of $\bar{U} + \frac{e_H(1 - q_L)}{q_H - q_L}$ if $x = x_H$.

---

[5] As alluded to before, the principal does not write a contract with the analyst and must rely on the analyst's pre-existing employment contract. For simplicity, we assume that the analyst's contract compels her to follow the firm (i.e., an individual rationality constraint for the analyst is not necessary).

[6] As will be confirmed shortly, the solution to (P) prescribes no off-equilibrium guidance. Thus, it also satisfies the (more stringent) requirements of a Perfect Bayesian equilibrium.

Managerial Moral Hazard Problem with Opportunistic Reporting

Layering in the issue of opportunistic managerial reporting necessitates the use of the third-party analyst as an independent information intermediary. Since the contract with x publicly observed stipulates a "bonus" for x_H, there is a clear temptation to overreport when $\hat{z}$ is used in lieu of x. If $\hat{z}$ is the only contracting variable, the principal cannot even provide effort incentives (the manager will always report $\hat{z}$ to get the highest pay and thus does not care about x).

Including the analyst's signal in the contract can restore incentives. Though the analyst's signal is at best a noisy measure of x, the fact that it is looming can discipline the manager's reporting. When reporting $\hat{z}$, the manager is cognizant of an impending analyst forecast that may undercut his claim. In effect, the analyst's independent research and subsequent forecast serve as a veracity check on the manager's reporting.

In this case, where x is opportunistically reported but (IC^A) is not an issue, the contract is intuitive. The setting is a standard moral hazard problem with the added constraint that the manager is given incentives not to overreport. And, since underreporting is of no concern, the principal shields the manager from risk related to the analyst's report if $\hat{z} = z_L$. If $\hat{z} = z_H$, on the other hand, then the principal either pays a reward or penalty, depending on whether the analyst's forecast is concordant with the earnings guidance. This line of reasoning follows that of other post-decision private information settings (e.g., Dye 1983; Gigler and Hemmer 2001).

To be more concrete, solving (P) without (IC^A) yields a utile payment of $\overline{U} - \frac{e_H q_L}{q_H - q_L}$ if $\hat{z} = z_L$, $\overline{U} + \frac{e_H(1 - q_L)}{q_H - q_L} + \frac{e_H(1 - p_H)}{(2p_H - 1)(q_H - q_L)}$ if $\hat{z} = z_H$ and $f = z_H$, and $\overline{U} + \frac{e_H(1 - q_L)}{q_H - q_L} - \frac{e_H p_H}{(2p_H - 1)(q_H - q_L)}$ if $\hat{z} = z_H$ and $f = z_L$. In effect, the contract provides the same payments as in the previous subsection, except some additional risk is placed on the manager to guarantee truthful reporting: the utile payment when $x = x_H$ is as before but is supplemented with a reward of $\frac{e_H(1 - p_H)}{(2p_H - 1)(q_H - q_L)}$ if the analyst's forecast matches the guidance or a penalty of $\frac{e_H p_H}{(2p_H - 1)(q_H - q_L)}$ if the analyst forecast does not match.

The key thing to note is that since the revelation principle holds in this scenario, the optimal contract elicits truthful earnings guidance by the manger in equilibrium. Introducing any bias in guidance would strictly reduce the principal's equilibrium payoff as doing so imposes extra compensation risk on the manager. With this benchmark in mind, we layer in the third incentive problem: the analyst's behavior.

Optimal Contract under the Confluence of Incentives

The problem with the benchmark contract in the preceding subsection is that when the analyst's incentives are considered, she clearly has no reason to exert effort and produce independent reports in the first place. With transparent managerial earnings guidance, the analyst need only parrot the manager's guidance as her forecast.

To overcome this problem, the principal needs to induce some measure of opacity in the manager's earnings guidance. That is, introducing some uncertainty for the analyst can be a sufficient motivator for research effort. And, since the report is useful in contracting only when $\hat{z} = z_H$, the goal is to introduce some uncertainty in that event.

Of course, if the analyst's incentive problem is too pronounced or her research does not offer enough precision, then no amount of opacity will convince the analyst to conduct an independent assessment and she will still follow the manager's guidance. In such a case, the confluence of incentive problems is so severe that it renders an equilibrium where $e = e_H$ impossible (without the analyst's discipline, the manager's behavior cannot be held in check). But, as long as the analyst can feasibly be convinced to conduct research, the manager's incentive problem can also be resolved. The following Lemma presents the conditions under which such an equilibrium can be achieved (all proofs are provided in the Appendix).

Lemma: There exists a solution to (P) if and only if:

$$a_H \leq L(2\rho - 1)\text{Min}\{p_H - q_H, p_H - 1/2\}.$$

Intuitively, the condition requires that the analyst's cost of effort is low enough (and the accuracy of diligent research, p_H, is high enough) that she would be willing to conduct research. The cutoff contains a minimum of two terms, because it must be the case that, upon observing $\hat{z} = z_H$, the analyst prefers conducting and truthfully reporting research both to shirking and reporting z_L and to shirking and reporting z_H. When the Lemma's condition is not met (and accounting earnings are not used in the contract), it is impossible to induce high effort from either the manager or the analyst. From here on, we assume the condition in the Lemma is (strictly) satisfied to focus on the optimal contract when the analyst can be used as an information intermediary.

Since the principal would like to use the analyst to "chase" reports of $\hat{z} = z_H$, a little overreporting can create enough uncertainty that the analyst will seek confirmatory research. If the analyst conducts research, then she also chooses to report the results truthfully—there is no reason to conduct research only to subsequently ignore it. However, too much overreporting is costly. This is because overreporting makes the manager's pay contingent on the analyst's report and, hence, requires a higher risk premium. The optimal contract balances these tensions as confirmed by the following proposition.

Proposition 1: The solution to (P) is:

$$u^*_{Lj} = \overline{U} - \frac{e_H q_L}{q_H - q_L};$$

$$u^*_{HL} = \overline{U} + \frac{e_H(1 - q_L)}{q_H - q_L} - \frac{e_H p_H}{(2p_H - 1)(q_H - q_L)};$$

$$u^*_{HH} = \overline{U} + \frac{e_H(1 - q_L)}{q_H - q_L} + \frac{e_H(1 - p_H)}{(2p_H - 1)(q_H - q_L)};$$

$$r^*_H(x_L) = \frac{q_H[a_H + L(1 - p_H)(2\rho - 1)]}{(Lp_H(2\rho - 1) - a_H)(1 - q_H)};\ r^*_H(x_H) = 1;$$

$$a^*(\hat{z} = z_L) = a_L;\ a^*(\hat{z} = z_H) = a_H;$$

$$f^*(\hat{z} = z_L, y) = z_L;\ f^*(\hat{z} = z_H, y_L) = z_L;\ f^*(\hat{z} = z_H, y_H) = z_H.$$

Note the contractual payments are identical to the case in the previous subsection in which the analyst incentive problem is absent. Even though the individual payments to the manager are the same, eliciting effort by the analyst is not free. Recall, the optimal contract in the previous subsection elicits truthful earnings guidance by the manager, and the manager is subject to compensation risk only when his guidance is z_H. The equilibrium identified in Proposition 1 entails more compensation risk, requiring the manager to issue guidance z_H with positive probability even when economic earnings are x_L (i.e., $r_H^*(x_L) > 0$). Hence, encouraging analyst effort is costly because it requires overreporting, which places additional risk on a manager who observes $x = x_L$.

The overreporting encapsulated in $r_H^*(x_L)$ is precisely the amount necessary to incentivize the analyst to conduct research instead of just parroting guidance. And, since setting $r_H(x_L) = 1$ is equivalent to providing no guidance, $r_H^*(x_L) \in (0,1)$ means that biased guidance is preferred both to fully revealing guidance and to no guidance.

The extent of bias introduced in guidance depends on the scale of the analyst's incentive problem. The more costly analyst research is (greater a_H), the more overreporting is required. And, the more accurate analyst research is (greater p_H or ρ) or the more costly it is for the analyst to be incorrect (greater L), the easier it is to motivate the analyst and, hence, the less overreporting is required.

Note that ρ enters the optimal contract only in that noise in accounting earnings effectively adds a layer of noise to the analyst's research (which provides a signal of economic earnings). Following the logic in the proof of the proposition, the solution to (P) is unchanged if the analyst's loss function reflects forecast errors relative to economic earnings; the only difference is that $r_H^*(x_L)$ reflects no ρ-induced noise for the analyst and is thus $\frac{q_H[a_H + L(1 - p_H)]}{(Lp_H - a_H)(1 - q_H)}$.

The contracting arrangement in the proposition is one where the analyst's forecast disciplines the manager, and the manager's biased guidance disciplines the analyst. The healthy tension between the two parties introduces a complementarity among information sources. Without the discipline of the analyst's report, the manager's guidance is useless in contracting, and motivating $e = e_H$ is not feasible. Without the discipline of opaque (noisy) managerial guidance, the analyst's report would be uninformative, and hence, motivating $e = e_H$ would again be impossible. Further, with the simple binary outcome setup, the noise in guidance takes the particular form of optimism.[7]

The Disciplinary Role of Accounting Earnings

While excluding the role of accounting as a discipline on managerial disclosures helps highlight the role of the analyst as an information intermediary, it also sidesteps an important role of financial statements. Permeating the literature in accounting on communication and incentives is the notion that the audited (hard) nature of accounting reports makes them well suited to discipline softer, manager-reported information. In this subsection, we allow accounting reports to serve this purpose and show that the analyst can play a similar role as before.

---

[7] In a more general model with continuous outcomes and effort, the form of opacity induced to motivate analyst research effort is not so clear-cut. Which reports the principal would like the analyst to follow up on will vary with the parameters of the problem and, thus, so will the amount and direction of induced noise.

In particular, assume the principal can write a contract on all publicly observed variables, i.e., $s = s(\hat{z}, f, z)$. In this case, both f and z serve as means of disciplining the manager's disclosure, $\hat{z}$. If $\rho = 1$, then the accounting report is a perfect signal of economic earnings and, thus, neither guidance nor the analyst will play a role. However, the oft-discussed relevance-reliability trade-off in accounting suggests that reliable (verifiable) accounting numbers often come with the price of not being perfect signals of a firm's underlying financial position (see, for example, Dye and Sridhar 2004). In such a circumstance, where $\rho < 1$, freely available analyst research would add another dimension of discipline and thus reduce the required risk premium in contracting. And, as long as incentivizing analyst research is not too difficult, the principal makes use of the analyst in the same fashion as before. Proposition 2 confirms this claim.

Proposition 2: If accounting earnings are used in contracting, the principal makes use of the analyst if $\rho < 1$, a_H is sufficiently small, and p_H is sufficiently large. In this case, the solution again prescribes:

$$r_H^*(x_L) = \frac{q_H[a_H + L(1 - p_H)(2\rho - 1)]}{(Lp_H(2\rho - 1) - a_H)(1 - q_H)};\ r_H^*(x_H) = 1;$$

$$a^*(\hat{z} = z_L) = a_L;\ a^*(\hat{z} = z_H) = a_H;$$

$$f^*(\hat{z} = z_L, y) = z_L;\ f^*(\hat{z} = z_H, y_L) = z_L;\ f^*(\hat{z} = z_H, y_H) = z_H.$$

The requirement for using the analyst in the proposition is analogous to that in the Lemma. Here, since accounting earnings alone are able to discipline the manager's reports and induce managerial effort, the bound on the analyst's incentive problem is more stringent. Now, not only should motivating analyst effort be possible, but the cost of doing so must also be sufficiently small relative to the benefit. As long as the more stringent bound is met, however, the use of guidance to create a balance between analyst and manager incentives is unchanged: $r_H^*(x_L) \in (0,1)$ implies that biased guidance provides strict benefits to the principal.

Though this setup with three contracting variables precludes closed-form solutions for the optimal managerial payments, the numerical example in Table 1 serves to illustrate the result.

TABLE 1
Numerical Example

Parameters:
$u(s) = \sqrt{s}$, $p_H = 3/4$, $q_H = 1/2$, $q_L = 1/4$, $\rho = 3/4$,
$L = 20$, $\overline{U} = 5$, $e_H = 1$, and $a_H = 1$

Solution:
$s(z_L, z_j, z_m) = 16.00$,
$s(z_H, z_L, z_L) = 2.69$, $s(z_H, z_L, z_H) = 43.56$,
$s(z_H, z_H, z_L) = 43.56$, $s(z_H, z_H, z_H) = 92.93$,
$r_H(x_L) = 0.54$, $r_H(x_H) = 1$
E[compensation] = 44.45

In the example, the analyst incentives are as before: overreporting occurs with just enough probability (0.54) that the analyst is willing to chase guidance of z_H. In this case, the analyst forecast and audited financial statement work in concert in disciplining managerial behavior. The reward payment in the event both the forecast and financial statement provide favorable signals (92.93) acts as a "carrot" to encourage effort, and the harsh punishment in the event the forecast and financial statement contradict managerial optimism (2.69) acts as a "stick" to keep optimism guarded.

Note that our analysis assumes accounting earnings arrive exogenously. If accounting earnings are also generated strategically (via auditor-manager interactions), then additional complications can arise with respect to motivating the auditor. In such a case, biased earnings guidance may also provide an added benefit of incentivizing independent assessment by the auditor.

Manager-Analyst Collusion

Since the goal of the principal's contract is to develop a tension between the manager and analyst, it seems apropos to investigate to what extent this tension can be sidestepped. Though the solution to (P) identifies one equilibrium (the principal's preferred one), it is not necessarily the only one. As is common in multi-agent situations, concerns of tacit collusion can arise if there exist other equilibria that make both parties (at least weakly) better off (e.g., Rajan 1992). In this setting, it turns out that such collusion equilibria do exist, which brings the effectiveness of the optimal contract into question. Fortunately, the collusion can readily be circumvented, as confirmed in Proposition 3.

> **Proposition 3:** At the solution to (P), there exist other equilibria in which the analyst and manager are each (weakly) better off. However, a minor contract perturbation with a cost arbitrarily close to zero mitigates the tacit collusion problem in the sense that the desired equilibrium is Pareto undominated in the manager-analyst subgame.

The collusion concern in this case is the manager choosing $e = e_L$ and an $r_H(x_L)$ slightly less than $r_H^*(x_L)$. Given such a strategy, the analyst, knowing x_H is less likely to be realized than it is in the principal's desired equilibrium, continues to conduct research upon observing $\hat{z} = z_H$. But, since she has to do so less often, she is better off than under the desired equilibrium. The contract perturbation adjusts the manager's payments to create a strict preference for $e = e_H$, thereby ruling out the possibility he will go along with collusive behavior. While such a mechanism helps rule out tacit collusion, it may still leave room for the possibility of explicit collusion via side payments. For more on this issue and mechanisms that curb side payments, see Laffont and Martimort (1997).

Discussion

While conventional wisdom assails earnings guidance as a tool for managers to manipulate gullible analysts, the model studied here suggests an alternative. In particular, by focusing on the role of analysts as information intermediaries, we show that a measure of opacity in guidance can actually be the glue that holds analyst and manager incentives in place. Though the result is derived in a stylized setting, it suggests that bias in earnings guidance may not necessarily be a sign of nefarious managerial behavior.

It should be stressed that the analysis here focuses on the role of earnings guidance and analyst forecasts from a contracting perspective. This labor market view is in contrast to the typical capital market view of guidance and analysts reports that stresses their use by market participants for valuation purposes. While incorporating capital market considerations may bring in detrimental aspects of bias, the broader point of the result is that labor market considerations suggest a mitigating factor. In this sense, the paper reiterates a common theme in agency theory that optimal information provision from an incentive perspective may be different from that from a decision-making perspective (e.g., Gjesdal 1981).

Taking the story one step further, consider the empirical evidence that gives rise to concerns of analysts being pawns in an "earnings guidance game." Summarizing the extant evidence, Jensen et al. (2004, 93) note that "an equilibrium has evolved in which analysts systematically overestimate the longer-term future earnings and then 'walk down' those forecasts as the actual date of the earnings report approaches. And in the end they systematically underestimate the final earnings." Hutton (2003) and Richardson et al. (2004) also provide evidence of the tendency for forecasts to swing around actual earnings over the forecast horizon. While this puzzling observation is suggestive of incentives gone awry, a similar effect can also arise in our setting where incentives are properly aligned. Consider a minor extension to the setup in which the analyst, upon observing earnings guidance, issues an initial forecast and later follows with an updated forecast after conducting additional research.

In this case, the contracting solution is as before, since the initial forecast adds no new information for managerial contracting purposes. The analyst's initial forecast can be determined as follows. When $\hat{z} = z_L$, the analyst can rest assured $x = x_L$, so she simply reports $f = z_L$. When $\hat{z} = z_H$, the analyst faces just enough uncertainty about whether x is x_H that she is willing to conduct additional research. Upon receiving guidance, the analyst's updated belief that $x = x_H$ is $\frac{q_H}{q_H + (1 - q_H)r_H^*(x_L)} = \frac{1}{2} + \frac{L(2\rho - 1)(2p_H - 1) - 2a_H}{2L(2\rho - 1)} > \frac{1}{2}$. Thus, her best guess of x is x_H and, hence, her best guess of z is z_H. That is, the optimism inherent in earnings guidance naturally carries forward to the analyst's first forecast.

The one-sided nature of the analyst's investigation means her final forecast, too, will be slanted. In particular, the only time errors in estimating x arise is subsequent to a report $\hat{z} = z_H$. Since $z = z_H$ is the more likely event in this case, errors in research are also more likely to surface in this event, leading to apparent pessimism in the final forecast. The following corollary summarizes the similarities between the result and noted empirical regularities.

Corollary: In the extended form of the analyst-manager interaction, as long as ρ is sufficiently large, the analyst's initial forecast is optimistic, while her final forecast is pessimistic.

While the walk-down in this setting is not gradual (there are only two forecasts), it does share two key features with empirical observation. First, early optimism in forecasting gives way to pessimism in the end. Second, since the late forecast is more precise, the early optimism is more pronounced than the late pessimism (see Figure 1 of Richardson et al. 2004); as shown in the proof to the Corollary, the magnitude of the expected forecast error is greater for the analyst's initial forecast than for the subsequent one.

The above reasoning, coupled with the result in Proposition 2, confirms that such biases in analyst forecasts can arise regardless of whether the final accounting earnings are used in contracting. Returning to the numerical example, the expected forecast error (forecast less actual) is $\frac{7}{26}(z_H - z_L)$ for the initial forecast and $-\frac{3}{52}(z_H - z_L)$ for the final forecast.

The results detailed in the corollary are subject to some caveats. First, while a key role of analysts is that of information intermediary (e.g., Soffer and Zhang 2004), we did not consider the alternative situation in which the analyst conducts research to offer information to which managers are not privy. In such a case, depending on the scenario, the firm may desire that the analyst chase bad news reports in order to refine the information included in the compensation contract, thereby reversing the biases highlighted herein.[8]

Another issue surrounds the binary nature of the forecast. Here, the analyst is forced to choose between z_L and z_H in her forecasts. If forecasts could take on any value in the continuum, then the results are unchanged given the analyst's assumed loss function: since the analyst incurs a fixed cost for any deviations from actual earnings, she is sure to pick one of the points as her estimate.

One might be concerned whether the result is sensitive to different specifications of the analyst's loss function. The following Observation speaks to this concern.

Observation: The Corollary also holds when the analyst's loss function takes a linear form, i.e., $L(f,z) = L|f - z|$.

Basu and Markov (2004) and Mikhail et al. (1999) provide evidence that a linear loss function is most consistent with analyst incentives. In this case, the analyst's preferred forecast is simply the more likely outcome and, thus, the results follow as before except L is replaced by $L|z_H - z_L|$. The bias now arises because the analyst's preferred guess is the median, not the mean (as in Gu and Wu 2003), and optimistic guidance and one-sided research each introduce opposite forms of skewness in the distribution. If, on the other hand, the analyst faces a quadratic loss function, $L(f,z) = L(f - z)^2$, then similar benefits to biased guidance can arise, but analyst biases disappear, since the forecast at each point in time is simply the posterior mean.

IV. CONCLUSION

This paper studies the use of multiple sources of information in contracting, where the information comes from self-interested parties. In particular, we examine contractual uses of managerial guidance and analyst forecasts. We find that each source of information serves to discipline the other. The healthy tension between the manager and analyst takes the form of optimistic managerial guidance, which in turn leads to biased analyst forecasts. The setting provides an explanation for biased earnings guidance that runs counter to conventional wisdom. In this case, bias may not be a symptom of opportunism by managers and analysts, but rather part of the cure.

In contrast to the traditional capital market valuation view, our paper adopts a labor market contracting view of the manager-analyst interactions. This approach brings both advantages and limitations. Although the labor market slant provides a contrasting look at the problem, it ignores other aspects and uses of earnings guidance and analyst forecasts. Future research could cast a wider net and incorporate additional institutional texture. For example, the presence of multiple analysts could introduce issues of group dynamics and herd behavior. In such a case, the principal may desire less transparent earnings guidance for a slightly different reason, to head off a potential information cascade.

---

[8] For more on the issue of conditional investigation, see Baiman and Demski (1980) and Christensen and Demski (2004). We thank a referee and Jonathan Glover for suggesting this point.

APPENDIX

Proof of the Lemma

Two observations will simplify the proof. First, without loss of generality, we can consider manager reporting strategies where $r_H(x_L) \leq r_H(x_H)$ and $r_H(x_H) > 0$. Any equilibrium in which $r_H(x_L) > r_H(x_H)$ or with $r_H(x_L) = r_H(x_H) = 0$ can be replicated by simply switching $\hat{z} = z_L$ and $\hat{z} = z_H$. Second, in any equilibrium, if the analyst chooses $a(z_k) = a_H$, then she also chooses $f(z_k, y_j) = z_j$. Intuitively, if the analyst chooses to conduct research, then she must also intend to use it.

The "if" part of the proof follows from the fact that, given the condition on a_H, the contract presented in Proposition 1 satisfies the constraints and specifies $r_H(x_L) \in [0,1]$. The "only if" part follows from the following examination of the possible equilibria when the a_H condition is not satisfied, classified by possible analyst strategies: (1) $a(z_k) = a_L$; (2) $a(z_L) = a_H$, $a(z_H) = a_L$; (3) $a(z_L) = a_L$, $a(z_H) = a_H$; and (4) $a(z_k) = a_H$.

(1) $a(z_k) = a_L$

In this case, the analyst's signal is completely uninformative, so her forecast depends only on the manager's initial report. When making his initial report, the manager faces no residual uncertainty and, hence, the (equilibrium) payments are, without loss of generality, free of both $\hat{z}$ and f. With constant payments, motivating $e = e_H$ is not feasible.

(2) $a(z_L) = a_H$, $a(z_H) = a_L$

Again, when $\hat{z} = z_H$, the analyst's signal is completely uninformative, so her forecast depends only on the manager's initial report. Denote the associated utile payment by u_H. Consider three cases:

(a) $r_H(x_L) = 0$, $r_H(x_H) = 1$: Here, since $\hat{z}$ is perfectly revealing, $a(z_L) = a_H$ is not feasible. (No new information can be gained by further analyst research.)

(b) $r_H(x_L) = 0$, $r_H(x_H) < 1$: For this reporting to be feasible, the (IC^M) constraint requires $u_H = p_H u_{LH} + (1 - p_H)u_{LL}$ and $u_H \leq p_H u_{LL} + (1 - p_H)u_{LH}$. Since the payments specify the manager's expected utility when $x = x_L$ is (at least weakly) larger than that when $x = x_H$, motivating $e = e_H$ is not feasible.

(c) $r_H(x_L) > 0$: In this case, the manager's expected utility is u_H both when $x = x_L$ and $x = x_H$. Again, motivating $e = e_H$ is not feasible.

(3) $a(z_L) = a_L$, $a(z_H) = a_H$

Analogous to (2), when $\hat{z} = z_L$, the analyst's signal is completely uninformative, so her forecast depends only on the manager's initial report. Denote the associated utile payment by u_L. Consider four cases:

(a) $r_H(x_L) = 0$, $r_H(x_H) = 1$: Since $\hat{z}$ is perfectly revealing, $a(z_H) = a_H$ is not feasible.

(b) $r_H(x_L) = 0$, $r_H(x_H) < 1$: In this case, an analyst observing $\hat{z} = z_H$ is certain $x = x_H$. $a(z_H) = a_H$ is not feasible.

(c) $r_H(x_L) > 0$, $r_H(x_H) = 1$: In this case, from (IC^A), the analyst would prefer $a(z_H) = a_H$ to simply reporting z_H only if $(Lp_H(2\rho - 1) - a_H)(1 - q_H)r_H(x_L) \geq q_H[a_H + L(1 - p_H)(2\rho - 1)]$. If $a_H > L(2\rho - 1)(p_H - q_H)$, this cannot be satisfied for any $r_H(x_L) \in [0,1]$. If $a_H \leq L(2\rho - 1)(p_H - q_H)$, it is satisfied for $r_H(x_L) \geq \frac{q_H[a_H + L(1 - p_H)(2\rho - 1)]}{(Lp_H(2\rho - 1) - a_H)(1 - q_H)}$. The analyst would prefer $a(z_H) = a_H$ to simply reporting z_L only if $r_H(x_L) \le \frac{q_H(Lp_H(2\rho - 1) - a_H)}{[L(1 - p_H)(2\rho - 1) + a_H](1 - q_H)}$. If $a_H > L(2\rho - 1)(p_H - 1/2)$, the two $r_H(x_L)$ conditions cannot both be satisfied.

(d) $r_H(x_L) > 0$, $r_H(x_H) < 1$: For this reporting to be feasible requires $u_{HH} = u_{HL} = u_L$. With the constant payment, motivating $e = e_H$ is not feasible.

(4) $a(z_k) = a_H$

Consider four cases:

(a) $r_H(x_L) = 0$, $r_H(x_H) = 1$: Since $\hat{z}$ is perfectly revealing, $a(z_H) = a_H$ is not feasible.

(b) $r_H(x_L) = 0$, $r_H(x_H) < 1$: In this case, an analyst observing $\hat{z} = z_H$ is certain $x = x_H$. $a(z_H) = a_H$ is not feasible.

(c) $r_H(x_L) > 0$, $r_H(x_H) = 1$: An analyst observing $\hat{z} = z_L$ is certain $x = x_L$, so $a(z_L) = a_H$ is not feasible.

(d) $r_H(x_L) > 0$, $r_H(x_H) < 1$: First, consider the case of $q_H \ge 1/2$, i.e., the Lemma condition is $a_H \le L(2\rho - 1)(p_H - q_H)$. From ($IC^A$), the analyst would prefer $a(z_H) = a_H$ to simply reporting z_H only if a_H is small enough. At $a_H = L(2\rho - 1)(p_H - q_H)$, the net benefit of choosing $a(z_H) = a_H$ is $-\frac{L(1 - q_H)q_H(r_H(x_H) - r_H(x_L))(2\rho - 1)}{q_H(r_H(x_H) - r_H(x_L)) + r_H(x_L)}$. Since this term is nonpositive, (IC^A) cannot be satisfied if $a_H > L(2\rho - 1)(p_H - q_H)$. For the second case, where $q_H < 1/2$, infeasibility follows the same logic as in case 3c. Choosing a_H over just reporting z_H requires $r_H(x_L)$ to be large enough and choosing a_H over just reporting z_L requires $r_H(x_L)$ to be small enough. If $a_H > L(2\rho - 1)(p_H - 1/2)$, the two $r_H(x_L)$ conditions cannot both be satisfied. ■

Proof of Proposition 1

From the proof of the Lemma, only two cases are potentially feasible when the a_H condition is satisfied: 3c and 4d.

In the 3c case, (IC^M) requires $p_H u_{HL} + (1 - p_H)u_{HH} = u_L$ and $u_{HH} = u_{HL} + \frac{a_H}{(2p_H - 1)(q_H - q_L)}$. Solving ($IR^M$) yields the following payments:

$$u_L = \overline{U} - \frac{e_H q_L}{q_H - q_L};\ u_{HH} = u_L + \frac{e_H p_H}{(2p_H - 1)(q_H - q_L)};$$

$$u_{HL} = u_L - \frac{e_H(1 - p_H)}{(2p_H - 1)(q_H - q_L)}.$$

From (IC^A), this represents an equilibrium if $r_H(x_L) \ge \frac{q_H[a_H + L(1 - p_H)(2\rho - 1)]}{(Lp_H(2\rho - 1) - a_H)(1 - q_H)}$. Though the manager is indifferent between u_L and the lottery of u_{HH} and u_{HL}, by the concavity of u, expected compensation is strictly less under u_L. Hence, the principal's desired equilibrium is $r_H(x_L) = \frac{q_H[a_H + L(1 - p_H)(2\rho - 1)]}{(Lp_H(2\rho - 1) - a_H)(1 - q_H)}$.

As for case 4d, (IC^M) requires $u_{HH} = u_{LH}$ and $u_{HL} = u_{LL}$ (payments are free of the initial report). The expected compensation under any such equilibrium can be replicated with an equilibrium from 3c, setting $r_H(x_L) = r_H(x_H) = 1$. Since the preferred 3c equilibrium provides an improvement over this case, it is the solution to (P). ■

Proof of Proposition 2

Since $\rho \in (1/2, 1)$, both f and z can be useful in contracting (both are informative in that they provide independent but noisy signals of x). The cost of using f is the added risk premium due to the induced bias in earnings guidance. Following effectively the same logic as in the proof of Proposition 1, the bias in earnings guidance required to use f in contracting is $r_H(x_L) = \frac{q_H[a_H + L(1 - p_H)(2\rho - 1)]}{(Lp_H(2\rho - 1) - a_H)(1 - q_H)}$. The benefit of using f is the reduction in risk premium due to the incremental information added by the analyst report, captured by p_H. As p_H approaches 1 and a_H approaches 0, the cost of using f approaches 0, while a strict benefit to using f remains. Hence, for p_H large enough and a_H small enough, the optimal contract uses f. And, by the logic in Proposition 1, using f entails the same level of earnings guidance and analyst strategies (only the manager payments at the optimal solution are changed). ■

Proof of Proposition 3

To examine other equilibria at the solution to (P), we consider four possibilities.

1) $e = e_H$ and $a(z_H) = a_H$.
   In this case, when $x = x_H$, the manager has a strict preference for reporting $\hat{z} = z_H$ (any equilibrium involves $r_H(x_H) = 1$ and, hence, $a(z_L) = a_L$). When $x = x_L$, the manager is indifferent in reporting. Any $r_H(x_L) > r_H^*(x_L)$ represents another equilibrium, as $a(z_H) = a_H$ remains feasible; here, the manager's utility is the same as in the desired equilibrium, while the analyst's is strictly less. $r_H(x_L) < r_H^*(x_L)$ does not satisfy equilibrium conditions, as the analyst prefers simply reporting z_H to choosing $a(z_H) = a_H$.
2) $e = e_H$ and $a(z_H) = a_L$.
   In this case, since the analyst's response to $\hat{z} = z_H$ is deterministic, the manager's expected utility is free of the x realization. Hence, the equilibrium conditions are not satisfied for $e = e_H$.
3) $e = e_L$ and $a(z_H) = a_H$.
   In this case, when $x = x_H$, the manager has a strict preference for reporting $\hat{z} = z_H$ (any equilibrium involves $r_H(x_H) = 1$ and, hence, $a(z_L) = a_L$). When $x = x_L$, the manager is indifferent in reporting. As in case 1, any $r_H(x_L) > r_H^*(x_L)$ represents another equilibrium, as $a(z_H) = a_H$ remains feasible. Unlike before $r_H(x_L) < r_H^*(x_L)$ may also satisfy equilibrium conditions: for large enough $r_H(x_L)$, the analyst's best response is still $a(z_H) = a_H$. And as long as $r_H(x_L)$ is not too large, the analyst is better off in the equilibrium than under the desired equilibrium (the manager is indifferent).
4) $e = e_L$ and $a(z_H) = a_L$.
   As in case 2, since the analyst's response to $\hat{z} = z_H$ is deterministic, the manager's expected utility is free of the x realization. Upon observing x, the manager chooses the $\hat{z}$ that yields the higher payment. If the analyst were to follow a z_H report with $f = z_H$, the manager always reports $\hat{z} = z_H$; but, the analyst's best response to this would be to follow up either with $f = z_L$ or $a(z_H) = a_H$. Hence, an equilibrium follows only if the analyst follows a z_H report with $f = z_L$. Here, the manager's expected utility is strictly less than that under the desired equilibrium (depending on the parameters, the analyst's may or may not be greater). Consequently, the tacit collusion problem in this case is not pressing.

Hence, case 3 presents other equilibria in which collusion concerns are pressing in that the equilibria are Pareto superior for the manager and analyst. Such a concern can be eliminated at an ε-cost by the following contract perturbation: $u_{Lj} = u^*_{Lj}$, $u_{HL} = u^*_{HL} - \frac{\delta}{p_H}$, and $u_{HH} = u^*_{HH} + \frac{\delta}{(1 - p_H)}$, $\delta > 0$. For δ sufficiently small, the increase in expected compensation under this contract is negligible. With this contract, the manager's reporting incentives are the same as before, but if $a(z_H) = a_H$, the manager has a strict preference for $e = e_H$. Hence, the equilibria in 3 are disabled. ■

Proof of the Corollary

First, consider the analyst's initial report. Upon observing $\hat{z} = z_H$, the analyst's revised belief that $x = x_H$ is $\frac{q_H}{q_H + (1 - q_H)r^*_H(x_L)} = \frac{1}{2} + \frac{L(2\rho - 1)(2p_H - 1) - 2a_H}{2L(2\rho - 1)} > \frac{1}{2}$. Her best guess of x is x_H and, hence, her best guess of z is z_H. In this case, her expected forecast error is $[q_H(1 - \rho) + (1 - q_H)r^*_H(x_L)\rho - (1 - q_H)(1 - r^*_H(x_L))(1 - \rho)][z_H - z_L]$. At the limit (ρ approaches 1), this equals $\frac{q_H(L(1 - p_H) + a_H)}{Lp_H - a_H}[z_H - z_L] > 0$. By continuity, the inequality is strict as long as ρ is sufficiently large. The analyst's expected forecast error on her revised (final) forecast is $[q_Hp_H(1 - \rho) + (1 - q_H)r^*_H(x_L)(1 - p_H)\rho][z_H - z_L] - [q_H(1 - p_H)\rho - (1 - q_H)r^*_H(x_L)p_H(1 - \rho) - (1 - q_H)(1 - r^*_H(x_L))(1 - \rho)][z_H - z_L]$. At the limit, this equals $-\frac{q_H(1 - p_H)(L(2p_H - 1) - 2a_H)}{Lp_H - a_H}[z_H - z_L] < 0$. Again, by continuity, the inequality is strict as long as ρ is sufficiently large. Observe $\left|-\frac{q_H(1 - p_H)(L(2p_H - 1) - 2a_H)}{Lp_H - a_H}[z_H - z_L]\right| - \left|\frac{q_H(L(1 - p_H) + a_H)}{Lp_H - a_H}[z_H - z_L]\right| < 0$, which implies that the early optimism is more pronounced than the late pessimism. ■

Proof of the Observation

Denote the analyst's belief that $x = x_H$ at a given point in time by $P(x_H|\cdot)$. With $L(f,z) = L|f - z|$, the analyst's forecast minimizes her expected loss:

$$[P(x_H|\cdot)\rho + (1 - P(x_H|\cdot))(1 - \rho)]L|f - z_H| \\ + [P(x_H|\cdot)(1 - \rho) + (1 - P(x_H|\cdot))\rho]L|f - z_L|.$$

Minimizing this entails setting $f = z_H$ if $P(x_H|\cdot) > ½$ and $f = z_L$ if $P(x_H|\cdot) \leq ½$. Hence, the analyst's choice amounts to picking the more likely among z_L and z_H. Following this logic, the proofs work as before, except L is replaced by the revised cost of an incorrect guess of $L|z_H - z_L|$. ■

REFERENCES

Arya, A., J. Glover, and S. Sunder. 1998. Earnings management and the revelation principle. *Review of Accounting Studies* 3: 7–34.

Baiman, S., and J. Demski. 1980. Economically optimal performance and evaluation control systems. *Journal of Accounting Research* 18 (Supplement): 184–220.

———, J. H. Evans, and J. Noel. 1987. Optimal contracts with a utility-maximizing auditor. *Journal of Accounting Research* 25 (Autumn): 217–244.

Barsky, N. 2002. The market game. *Wall Street Journal* (May 8): A18.

Basu, S., and S. Markov. 2004. Loss function assumptions in rational expectations tests on financial analysts' earnings forecasts. *Journal of Accounting and Economics* 38 (December): 171–203.

Christensen, J., and J. Demski. 2004. Asymmetric monitoring: Good versus bad news verification. *Schmalenbach Business Review* 56 (July): 206–222.

Demski, J. 1998. Performance measure manipulation. *Contemporary Accounting Research* 15 (Fall): 261–285.

Dye, R. 1983. Communication and post-decision information. *Journal of Accounting Research* 21 (Autumn): 514–533.

———, and S. Sridhar. 2004. Reliability-relevance trade-offs and the efficiency of aggregation. *Journal of Accounting Research* 42 (March): 51–88.

Fellingham, J., and P. Newman. 1985. Strategic considerations in auditing. *The Accounting Review* 60 (October): 634–650.

Francis, J., and D. Philbrick. 1993. Analysts' decisions as products of a multi-task environment. *Journal of Accounting Research* 31 (Autumn): 216–230.

Gigler, F., and T. Hemmer. 2001. Conservatism, optimal disclosure policy, and the timeliness of financial reports. *The Accounting Review* 76 (October): 471–493.

Gjesdal, F. 1981. Accounting for stewardship. *Journal of Accounting Research* 19 (Spring): 208–231.

Gu, Z., and J. Wu. 2003. Earnings skewness and analyst forecast bias. *Journal of Accounting and Economics* 35 (April): 5–29.

Hayes, R. 1998. The impact of trading commission incentives on analysts' stock coverage decisions and earnings forecasts. *Journal of Accounting Research* 36 (Fall): 299–320.

Hong, H., J. Kubik, and A. Solomon. 2000. Security analysts' career concerns and herding of earnings forecasts. *RAND Journal of Economics* 31 (Spring): 121–144.

Hutton, A. 2003. Determinants of managerial earnings guidance prior to regulation fair disclosure and bias in analysts' earnings forecasts. Working paper, Dartmouth College.

Jensen, M., K. Murphy, and E. Wruck. 2004. Remuneration: Where we've been, how we got to here, what are the problems, and how to fix them. Working paper, European Corporate Governance Institute.

Laffont, J., and D. Martimort. 1997. Collusion under asymmetric information. *Econometrica* 65 (July): 875–911.

Lim, T. 2001. Rationality and analysts' forecast bias. *Journal of Finance* 56: 369–385.

Matsunaga, S., and C. Park. 2001. The effect of missing a quarterly earnings benchmark on the CEO's annual bonus. *The Accounting Review* 76 (July): 313–332.

Mikhail, M., B. Walther, and R. Willis. 1999. Does forecast accuracy matter to security analysts? *The Accounting Review* 74 (April): 185–200.

Rajan, M. 1992. Cost allocation in multi-agent settings. *The Accounting Review* 67 (July): 527–545.

Richardson, S., S. Teoh, and P. Wysocki. 2004. The walk-down to beatable analyst forecasts: The role of equity issuance and insider trading incentives. *Contemporary Accounting Research* 21 (Winter): 885–925.

Sansing, R. 1993. Information acquisition in a tax compliance game. *The Accounting Review* 68 (October): 874–884.

Soffer, L., and H. Zhang. 2004. The role of security analysts and its implications for Regulation FD. Working paper, University of Illinois at Chicago.

Welch, I. 2000. Herding among security analysts. *Journal of Financial Economics* 58 (December): 369–396.

Zimmerman, J. 2000. *Accounting for Decision Making and Control.* Boston, MA: Irwin McGraw-Hill.

THE ACCOUNTING REVIEW
Vol. 80, No. 4
2005
pp. 1211–1231

Accounting for Software Development Costs and Information Asymmetry

Emad Mohd
McMaster University

ABSTRACT: I investigate the impact of implementing SFAS No. 86, which provides an exception to the GAAP requirement of the immediate expensing of research and development (R&D), on information asymmetry. Using bid-ask spread and share turnover as proxies for information asymmetry, I find that after the introduction of SFAS No. 86, information asymmetry decreases for software firms relative to that of other high-tech firms. Within the software industry, I find that information asymmetry is significantly lower for firms that capitalize (capitalizers) than for those who expense (expensers) software development costs. Thus, accounting for software development costs per SFAS No. 86 reduces information asymmetry and, consequently, the cost of capital. As well, investors' uncertainty about the future benefits of software development costs is reduced when firms capitalize these costs.

Keywords: *information asymmetry; software development costs; SFAS No. 86; capitalization; intangibles.*

Data Availability: *Data are available from sources identified in the paper.*

I. INTRODUCTION

This paper examines the impact of accounting for software development costs per the Statement of Financial Accounting Standards No. 86 (SFAS No. 86, FASB 1985) on information asymmetry. SFAS No. 86, which requires the capitalization of certain software development costs, is an exception to SFAS No. 2, which requires the immediate expensing of all R&D. Expensing creates ambiguity among investors about the value of R&D, thus increasing the information gap between management and investors. Consistent with this logic, many studies demonstrate that R&D-intensive firms have higher information asymmetry (Aboody and Lev 2000; Barth and Kasznik 1999; Barth et al. 2001; Boone and Raman 2001).

This paper is based on my doctoral dissertation at Georgia State University. I thank my committee members, Larry Brown (chair), Omesh Kini, Tom Lopez, and Siva Nathan for their guidance and help. I also thank Paul Chaney, Karl Hackenbrack, Debra Jeter, Sam Tiras, workshop participants at Georgia State University, University of Illinois at Urbana–Champaign, SUNY at Buffalo, Vanderbilt University, the 2003 American Accounting Association Annual Meeting, and two anonymous referees for their valuable comments. The research assistance of Andrea Fraser is gratefully acknowledged. I acknowledge the financial support of the Jacob School of Management at SUNY at Buffalo, the DeGroote School of Business at McMaster University, and the Social Sciences and Humanities Research Council of Canada (SSHRC).

Editor's note: This paper was accepted by Terry Shevlin, Senior Editor.

Submitted March 2004
Accepted April 2005

Capitalizing R&D has been proposed to reduce information asymmetry (Aboody and Lev 2000; Boone and Raman 2001).[1] When firms capitalize R&D they convey information to the market about the success of these activities, which in turn affects investors' beliefs about R&D future payoffs, resulting in a reduction in information asymmetry. However, recognizing R&D capital is not the only way managers can convey information about the expected future benefits of R&D. They can convey the same information via other means of voluntary disclosures. Disclosure, however, is not as informative as recognition for two reasons. First, recognized amounts in the financial statements are audited, while voluntary disclosures are not—which lends more credibility to recognition. Second, it is more costly to extract useful information from voluntary disclosures than from recognized amounts. Investors with accounting expertise can collect information from disclosures at a lower cost, thus gaining an informational advantage over unsophisticated investors (Barth et al. 2003). Managers also may refrain from voluntarily disclosing information about the future benefits of R&D because the costs associated with more disclosure (e.g., revelation of proprietary information and potential litigation brought on by investors in case expected future benefits are not realized) can outweigh the benefits of lower information asymmetry (Core 2001). Hence, voluntary disclosure would not necessarily eliminate information asymmetry resulting from failure to recognize R&D capital.

Another issue related to R&D is the high uncertainty of their expected future benefits. Kothari et al. (2002, 356) argue "the greater the uncertainty of future economic benefits of R&D expenditures, the weaker would be the case in favor of capitalization." This argument implies an "uncertainty threshold," where expenditures should be capitalized if the uncertainty of expected future benefits falls below this threshold, and expensed otherwise. FASB does not provide guidelines on "uncertainty threshold," but SFAS No. 2 suggests that the FASB believes that the uncertainty of R&D is well above that threshold.

Information asymmetry indicates that some investors are better able to assess the future benefits than others. Therefore, the higher information asymmetry for R&D-intensive firms suggests that the uncertainty threshold of the expected future benefits of R&D expenditures is not prohibitively high. Thus, management can provide reliable information about R&D future benefits when allowed to capitalize. Management, however, may not convey useful information if it exploits capitalization to manage earnings upward. Moreover, some managers may elect to expense even when they have reliable estimates of a project's future benefits. Whether management conveys useful information by capitalizing successful efforts is an empirical issue.

The setting I select to examine the impact of capitalizing R&D on information asymmetry is SFAS No. 86, which requires capitalizing software development costs after the project reaches technical feasibility. This setting allows me to examine whether capitalizing certain R&D expenditures reduces information asymmetry. My experimental group consists of firms in software industries, and my control group is comprised of firms in other high-tech industries. I select high-tech firms as a control group because they too invest heavily in R&D and the capitalization of R&D is of major importance to them. My research design examines changes in the proxies for information asymmetry *after* versus *before* the adoption of SFAS No. 86. I compare these changes between software firms and other high-tech firms.

I also analyze the differences in information asymmetry between capitalizers and expensers in software industries after the adoption of SFAS No. 86. Specifically, I examine whether firms that capitalize software development costs (capitalizers) provide more useful information than do firms that expense all these costs (expensers). If managers exploit SFAS No. 86 to manage earnings rather than to convey useful information about expected future benefits, then investors would be skeptical about the long-term profitability of capitalized software development costs, and they will discount capitalization information. If so, then capitalization will not diminish the information gap between managers and investors.[2]

---

[1] Aboody and Lev (2000, 2765) propose that "improved disclosure about R&D operations, such as the capitalization of development cost when products successfully pass the technological feasibility tests ... might be considered as means for mitigating the R&D-related information asymmetry."

I conduct the analyses over the periods of 1983–1985 and 1986–1988 for pre- and post-SFAS No. 86, respectively. My sample consists of 67 software firms and 448 other high-tech firms. I perform the analyses of capitalizers versus expensers after SFAS No. 86 over the 1986–1995 time period based on a sample of 37 firms and 253 firm-years. I use relative bid-ask spread and share turnover as proxies for information asymmetry.[3]

In the comparison between software and other high-tech firms, information asymmetry is significantly higher for software firms before SFAS No. 86. After SFAS No. 86, changes in the proxies for information asymmetry are consistent with a decline (increase) in information asymmetry for software (other high-tech) firms. The differences in these changes are significant, suggesting a decline in information asymmetry for software firms relative to other high-tech firms. Additionally, the comparison between capitalizers and expensers within software firms shows that capitalizers have lower information asymmetry than expensers after SFAS No. 86.

My results are consistent with capitalizing R&D expenditures reducing information asymmetry, but this support is qualified by the generalizability of software development costs to all R&D expenditures. It is possible that FASB has allowed capitalization of software development costs because it is the one area where firms can reliably estimate future benefits of R&D.

My research contributes to the debate on accounting and disclosure for internally generated intangibles. R&D is an internally generated intangible asset because empirical evidence documents the association between future benefits and current R&D expenditures. Proponents of R&D capitalization and other internally generated intangibles cite this evidence (e.g., Lev and Zarowin 1999). However, the value relevance of R&D expenditures has been established in hindsight, and it is unclear that managers can reliably estimate these benefits *ex ante*. Opponents of capitalizing internally generated intangibles argue that information about expenditures on intangibles is publicly available, and that investors can assess the future benefits of these investments.[4]

This paper is organized as follows. I review the relevant literature on accounting for intangibles, disclosure, and information asymmetry in Section II. I develop hypotheses in

---

[2] Anecdotal evidence suggests that investors are skeptical of firms that capitalize software development costs. For example, "Slucus Computer has made every effort to demonstrate that its judgments [to capitalize software development costs] are well within the boundaries of generally accepted accounting practices. The company even included, with each investor-relations packet it sends out, a cogent and favorable examination of the aforementioned FASB statement [SFAS No. 86], prepared by an analyst from a big, fancy brokerage house" (Davey 1992).

[3] Dispersion of financial analysts' forecasts is another proxy of information asymmetry. I do not use this measure because I do not have a large enough sample of analysts' forecasts in the earlier years of my sample (i.e., 1983–1985).

[4] Association for Investment Management Research (AIMR), which represents financial analysts, portfolio managers, and other investment professionals, articulated its position in the report "Financial Reporting in the 1990s and Beyond": "We are not enamored of recording self-developed intangible assets unless their values are readily apparent. We consider the cost of creating them to be so often unrelated to their actual value as to be irrelevant in the investment valuation process. Furthermore, it usually is next to impossible to determine in any sensible or codifiable manner exactly which costs provide future benefit and which do not" (AIMR 1993, 50–51).

Section III, and present my methodology in Section IV. I provide the results in Section V and conclude in Section VI.

II. PRIOR LITERATURE

Accounting for Intangibles

GAAP requires that internal expenditures on intangibles, such as research and development (R&D), be expensed as incurred (SFAS No. 2). Despite this requirement, recent evidence shows that R&D expenditures are value-relevant (e.g., Lev and Sougiannis 1996). The findings of Lev and Sougiannis (1996), however, establish the value relevance of R&D with the benefit of hindsight, but they do not address whether these benefits can be established *ex ante*. The future benefits from investments in intangibles are highly uncertain, making them difficult to measure. For example, Kothari et al. (2002) show that the contribution of current R&D expenditures to the variability of future earnings is three times greater than that of investment in property, plant, and equipment.

The FASB contention and the findings of Kothari et al. (2002) imply that the high uncertainty of the future benefits of R&D impedes managers from providing reliable information about these benefits. What remains unanswered is whether management can provide reliable information about the expected benefits of R&D when they are allowed to capitalize these expenditures despite their high uncertainty.

SFAS No. 86 provides an exception to expensing internally generated intangibles. Aboody and Lev (1998) examine the value relevance of software development costs for firms in the software industries and find: (1) annually capitalized software costs are positively associated with stock returns, and (2) software development capital assets are positively associated with stock prices. Healy et al. (2002) show that a simple capitalization rule of R&D, similar to successful efforts accounting (SFAS No. 19, FASB 1977), provides a higher association between accounting information and economic values than either immediate expensing or full capitalization.

My study differs from the above studies in three respects. First, the above studies examine the value relevance of intangibles within a single accounting regime. For example, all firms in Lev and Sougiannis (1996) are required to expense R&D, and all firms in Aboody and Lev (1998) are required to capitalize, although only some of them capitalize. Healy et al. (2002) provide results for a simulated pharmaceutical firm. In contrast, my sample consists of two groups of firms under two different accounting regimes: software firms required to capitalize (but can also expense) and other high-tech firms that are always required to expense R&D.[5] Second, while the above studies examine the association between accounting information and market value, I examine bid-ask spread and share turnover, which represent economic costs to the firm. Third, I use a research design that examines differences in the change in information asymmetry between software firms and other high-tech firms post- versus pre-SFAS No. 86. My research design ensures that intertemporal changes for software firms are not due to period effects.

Accounting for Intangibles and Information Asymmetry

Barth and Kasznik (1999) find that intangible assets associated with R&D are significantly positively related to share repurchases, which is consistent with higher information asymmetry for R&D-intensive firms. Aboody and Lev (2000) document abnormal trading activities by insiders of R&D-intensive firms, which is also consistent with a positive relation between R&D activities and information asymmetry. Moreover, Barth et al. (2001) show that intangible-intensive firms receive greater analyst coverage. Since Brennan and Subrahmanyam (1995) document a positive association between information asymmetry and analyst coverage, the Barth et al. (2001) results support a positive association between R&D and information asymmetry.

---

[5] Although SFAS No. 86 requires capitalizing certain software development costs, its flexibility enables firms to capitalize or expense when they wish to do so.

The above studies provide indirect evidence on the relation between R&D activities and information asymmetry. Boone and Raman (2001) examine this relation directly by examining the association between R&D capital, estimated using the methodology of Lev and Sougiannis (1996), and two proxies for information asymmetry: the adverse selection component of the bid-ask spread and depth. They find that (1) information asymmetry for R&D firms is higher than for non-R&D firms, (2) the magnitude of information asymmetry for R&D firms is related to the estimated magnitude of unrecorded R&D assets, and (3) the change in the information asymmetry for R&D firms is related to the change in the magnitude of unrecorded R&D assets.

Diamond and Verrecchia (1991) posit that revealing information to reduce information asymmetry reduces firms' cost of capital by attracting increased demand from investors. The results of a positive association between R&D and information asymmetry are consistent with the other side of the position of Diamond and Verrecchia (1991); that is, insufficient disclosure about the expected future R&D payoffs results in greater information asymmetry. Although theory predicts that allowing R&D capitalization reduces information asymmetry, it is unclear whether companies will actually provide more useful information. A case in point is the example of large software firms that choose to always expense despite the fact that their software products are successful (Microsoft, Borland, Symantec, and Novell are examples of these companies).[6] Companies that exploit capitalization to manage earnings might not also provide additional information as expected.

I contribute to the literature by analyzing the effects of capitalizing certain R&D expenditures on information asymmetry. My study is important because information asymmetry is a real economic cost to the company in the form of higher cost of capital.[7] Regulators are concerned about information asymmetry and they cite high-quality accounting as a solution. For example, Arthur Levitt, former chairman of the U.S. Securities and Exchange Commission (SEC), provides the viewpoint of regulators on the role of accounting:

> It bears repeating: high-quality accounting standards result in greater investor confidence, which improves liquidity, reduces cost of capital, and makes fair market prices possible. (Levitt 1998, 81)

---

[6] There are many reasons why companies do not capitalize, even when they have successful software projects. Microsoft, for example, reports that amounts that qualify for capitalization are immaterial. Sometimes companies do not capitalize because costs associated with more disclosure (e.g., revelation of proprietary information and potential litigation brought by investors in case expected future benefits are not realized) outweigh the benefits of reduced cost of capital (Core 2001). Another reason not to capitalize is to signal higher quality earnings to the market.

[7] An obvious test would be to directly examine the impact of capitalization on an *ex ante* estimate of the cost of capital. Most estimates of the cost of capital require at least two-year-ahead analyst earnings forecasts (see Easton et al. 2002; Gebhardt et al. 2001). I do not estimate the cost of capital because I do not have sufficient analyst forecast data for my sample period.

III. HYPOTHESES DEVELOPMENT

Once management has a reliable estimate of expected future benefits and the software development project is past the technical feasibility stage, SFAS No. 86 requires that managers capitalize software development costs if they expect the project to succeed. Absent management manipulation to boost earnings, investors will learn that the firm has a successful project when the costs of this project are capitalized, and the information gap between investors and management will shrink. That is, management will resolve investors' uncertainty about the future benefits of firms' investments.

When management expenses software development costs, the signal to investors is unclear. If management expenses software development costs because it has information that the project will fail, and investors know that, then the information gap between investors and management diminishes, since such information resolves investors' uncertainty about future benefits. However, if the management expenses software development costs because it is uncertain about their future benefits or because it wants to do so for reasons such as to reduce political costs (Watts and Zimmerman 1986), then investors' uncertainty about future benefits remains unresolved and the information gap does not diminish.

I measure the effectiveness of SFAS No. 86 in reducing information asymmetry by comparing the change in information asymmetry between software firms and other high-tech firms after introduction of SFAS No. 86. I confine the experimental group to other high-tech firms because these firms invest as heavily in R&D as do software firms. The purpose of the comparison is to evaluate the overall effectiveness of the standard in reducing information asymmetry. My first hypothesis, in the alternative form, is:

H1: *Ceteris paribus*, the change in information asymmetry after SFAS No. 86 is lower for software firms than for other high-tech firms.

The above arguments also apply to the comparison between capitalizers and expensers in software industries. If management has perfectly reliable information (i.e., it knows with certainty whether the software project will succeed (fail)), if it conveys this information to investors by capitalizing (expensing) software development costs, and if investors know managers to be credible, then this information should mitigate investors' uncertainty about the future benefits of the firms' investment in these projects. Thus, I should not observe any difference in information asymmetry between capitalizers and expensers after implementation of SFAS No. 86.

With managers having less than perfect information, the signal from capitalizing is clear, i.e., managers expect the project to succeed. The signal from expensing software development cost, though, is mixed. It could mean that the management expects the project to fail, it does not have sufficient information about future benefits, or it chooses to expense even when it has reliable information about successful projects.[8] Therefore, I predict that information asymmetry for capitalizers will be lower than for expensers. The second hypothesis, in the alternative form, is:

H2: *Ceteris paribus*, information asymmetry is significantly lower for capitalizers than for expensers after implementation of SFAS No. 86.

---

[8] This argument assumes that managers are credible and they do not exploit capitalization to manage earnings. When earnings are managed through capitalization, investors' uncertainty remains unresolved.

IV. SAMPLE AND METHODOLOGY

Sample Selection for Software versus other High-Tech Firms

My sample of firms in the software industries includes firms engaged in computer programming and prepackaged software (SIC 7370–7374). Based on the classification in Francis and Schipper (1999), other high-tech firms are those in the following three-digit SIC codes: 283 (drugs), 357 (computer and office equipment), 360 (electrical machinery and equipment), 361 (electrical transmissions and distribution equipment), 362 (electrical industrial apparatus), 363 (household appliances), 364 (electrical lighting and wiring equipment), 365 (household audio, video equipment, and audio receiving), 366 (communication equipment), 367 (electronic equipment, semiconductors), 368 (computer hardware), 481 (telephone communications), and 873 (research, development, and testing services). I also include in other high-tech firms the three-digit SIC code 737 (computer programming, software, and data processing) other than software firms.

Since SFAS No. 86 became effective for fiscal years ending after December 15, 1985, I define the years 1983–1985 as before SFAS No. 86, and the years 1986–1988 as after SFAS No. 86. To be included in the sample, firms must have at least one observation before and one observation after SFAS No. 86. My final sample consists of 67 firms in software industries and 448 firms in other high-tech industries.

Table 1 presents annual averages of financial characteristics of sample firms before and after SFAS No. 86. The change in any variable is the simple average (mean) of this variable after SFAS No. 86 minus the average before SFAS No. 86. Overall, other high-tech firms are significantly larger than software firms both before and after SFAS No. 86 on the following dimensions: sales, total assets, book value of equity, long-term debt, and net income.

Sample Selection for Capitalizers versus Expensers

I perform the analyses on capitalizers versus expensers during the period after SFAS No. 86 because all software firms were required to expense software development costs before SFAS No. 86, so one cannot distinguish between capitalizers and expensers.[9] The comparisons between capitalizers and expensers require data on capitalized software development costs, software development capital, and amortization of software development capital, which must be collected directly from the annual reports because they are not available on Compustat. I start with software firms from the first set of tests.[10] I eliminate companies that do not report these items separately.[11,12] The period covered in these analyses is 1986–1995, and the sample consists of 37 firms and 253 firm-year observations.

I classify a software firm as a capitalizer if it capitalizes at least some of its software development costs after SFAS No. 86 and as an expenser if it expenses all its soft-

---

[9] I perform the same analysis as in the first set of tests where firms are classified as expensers and capitalizers based on whether they capitalized post SFAS No. 86. Under this approach a firm has to be classified as a capitalizer or an expenser for all years, which raises a problem in classifying firms that capitalized in some years and expensed in other years after SFAS No. 86. I consider three possible classification schemes for these firms under which a firm is classified as a capitalizer if it capitalized in (1) all years after SFAS No. 86, (2) at least one year after SFAS No. 86, or (3) more than half the period after SFAS No. 86. The test variable has its expected signs in both regressions under all three schemes, and it is significant in the second and the third schemes.

[10] I obtain similar results when I perform the analyses on all software firms with available data.

[11] For example, some companies include software development capital in other assets, and some report capitalized purchased and internally developed software costs in one line.

[12] I perform the regressions in Table 4 without these companies. The results are qualitatively similar.

TABLE 1
Financial Characteristic of Sample Firms
(n = 67 software firms, 448 other high-tech firms)

Panel A: Before SFAS No. 86[a]

Variable	Other[b]	Software[b]	t-value[c]
Sales	793.270	51.378	3.81***
Total Assets	884.160	44.008	3.69***
R&D	37.192	3.839	3.66***
BV	403.940	27.501	3.67***
LTD	149.260	3.601	2.83***
NI	55.061	3.371	3.05***
Panel B: After SFAS No. 86			
Sales	1,038.900	95.638	4.15***
Total Assets	1,193.300	88.941	4.19***
R&D	56.499	7.334	3.64***
BV	492.140	50.794	3.84***
LTD	181.540	10.630	4.42***
NI	60.666	7.642	3.46***
Panel C: Change (after minus before SFAS No. 86)			
Sales	245.610	44.260	3.05***
Total Assets	309.140	44.933	1.84*
R&D	19.307	3.495	3.15***
BV	88.200	23.293	1.23
LTD	32.280	7.029	0.73
NI	5.605	4.271	0.18

*,**,*** Denotes significance (two-tailed test) at a probability level below 0.10, 0.05, and 0.01, respectively.

[a] Before SFAS No. 86 is the fiscal years 1983–1985, and after SFAS No. 86 is the fiscal years 1986–1988.

[b] Software is firms in the software industries (four-digit SIC codes 7370–7374). Other is firms in other high-tech industries (three-digit SIC codes: 283, 357, 360–368, 481, 7375–7379, and 873).

[c] t-value of the difference between software and other high-tech firms.

Sales = annual gross sales minus discounts and sales returns and allowances (Compustat item # 12);
Total Assets = fiscal year-end (Compustat item # 6);
R&D = annual research and development expenditure (Compustat item # 46);
BV = common stockholders' interest in the company (Compustat item # 60);
LTD = long-term debt (Compustat item # 9); and
NI = annual net income before extraordinary items (Compustat item # 18).

ware development costs. Of the 37 firms, 19 capitalized software development costs in each year, ten expensed in each year, and eight expensed in some years and capitalized in others. Table 2 presents descriptive financial characteristics for capitalizers and expensers. The overall statistics show that capitalizers are significantly larger than expensers along all the dimensions. Of particular interest is development intensity, (*DEVINT*), which is the sum of R&D expense and software development scaled by sales. The larger magnitude of *DEVINT* is consistent with the intuition that firms with larger R&D expenditures have a greater chance of a successful project, and thus are more likely to capitalize.

TABLE 2
Financial Characteristic of Software Firms[a]

Variable	Expensers	Capitalizers	t-value[b]
Sales	116.370	313.840	3.93***
Total Assets	66.368	305.380	4.45***
DEVINT	0.061	0.154	7.56***
BV	39.616	156.360	4.69***
LTD	4.445	22.361	2.79***
NI	5.359	28.601	3.43***

*,**,*** Denote significance (two-tailed test) at a probability level below 0.10, 0.05, and 0.01, respectively.

[a] The sample consists of 37 firms and 253 firm-year observations. I classify a software firm as a capitalizer if it capitalizes at least some of its software development costs after SFAS No. 86 and as an expenser if it expenses all its software development costs. Of the 37 firms, 19 capitalized software development costs in each year, ten expensed in each year, and eight expensed in some years and capitalized in others.

[b] t-value of the difference between capitalizers and expensers.

Sales = annual gross sales minus discounts and sales returns and allowances (Compustat item # 12);
Total Assets = fiscal year-end (Compustat item # 6);
DEVINT = R&D expense plus capitalized software, scaled by sales;
BV = common stockholders' interest in the company (Compustat item # 60);
LTD = long-term debt (Compustat item # 9); and
NI = annual net income before extraordinary items (Compustat item # 18).

Methodology

Dependent Variables

I use two variables as proxies for information asymmetry: the relative bid-ask spread and share turnover. When information asymmetry between management and investors is high, some traders can generate their private information and exploit it to gain *vis-à-vis* uninformed traders. Stock dealers realize this informational advantage and increase the bid-ask spread to protect themselves against exploitation by informed traders. I measure bid-ask spread (*SPREAD*) as the daily absolute spread divided by the average of bid and ask. Share turnover (*TURNOVER*) is the daily trading volume in shares divided by shares outstanding. Firms with high information asymmetry have lower share turnover because uninformed traders are less likely to trade in these shares, knowing that they will lose to informed traders.[13]

Control Variables

Prior research shows that firm size, stock return volatility, stock exchange listing, stock price, and analyst coverage are associated with bid-ask spread. The amount of information available about a firm is greater for larger firms (Atiase 1985). Therefore, I expect firm size to be associated negatively (positively) with bid-ask spread (share turnover). I measure firm size as the market capitalization as of fiscal year-end (*MV*). Stock return volatility is positively related to bid-ask spread, since market makers increase the spread to make up for the uncertainty associated with volatile stocks (Stoll 1978). I use the standard deviation of daily returns as a proxy of return volatility (*VOLATILITY*). Exchange listing is also related to bid-ask spread: firms listed on the NASDAQ have higher bid-ask spread than NYSE-listed firms (Bessembinder and Kaufman 1997). I include a dummy variable (*LISTING*) that equals 1 if the firm is listed on NYSE or AMEX, and 0 otherwise.

---

[13] Leuz and Verrecchia (2000) and Roulstone (2003) are examples of recent accounting papers that have used the same proxies for information asymmetry.

The association between stock price and bid-ask spread is mechanical since firms with low stock price have higher relative bid-ask spread because of the minimum tick size of 1/8 during my sample period (Stoll 1978). Therefore, I include stock price (*PRICE*) in the bid-ask spread regression. Analyst coverage is negatively related to bid-ask spread since greater analyst coverage increases the amount of information available about the firm (Roulstone 2003). Therefore, I include the variable, *FOLL,* in the regression: *FOLL* is the number of analysts issuing annual forecasts as of the fiscal year-end.

Share turnover is associated with firm size, analyst coverage, the number of shares outstanding, and the inclusion in the S&P 500 index. It is positively associated with firm size because the availability of information on larger firms induces more trading, and it is positively associated with analyst coverage because analysts reduce the information gap between informed and less-informed traders, which in turn increases the trading volume (Roulstone 2003). Roulstone also argues that firms with larger amount of shares outstanding will have higher trading volume, so I include the number of shares outstanding (*SHROUT*) in the share turnover regression. Finally, the relation between share turnover and the inclusion in the S&P 500 index is unclear (Tkac 1999), but to avoid omitting a correlated variable, I include the dummy variable (*SP500*), which equals 1 if the firm is included in the S&P 500 index, and 0 otherwise, in the share turnover regression.

Endogeneity of Dependent Variables

The dependent variables, which are proxies for information asymmetry, are endogenous. On the one hand, firms with higher trading volume tend to have lower bid-ask spreads, therefore, share turnover is a control variable in the bid-ask spread regression. On the other hand, the bid-ask spread is a control variable in the share turnover regression because firms with higher bid-ask spread have lower trading volumes. Therefore, I estimate the following set of equations by employing two-stage least squares regressions (2SLS):

$$\begin{aligned} SPREAD_{it} = {} & \alpha_0 + \overset{?}{\alpha_1 SOFT_{it}} + \overset{?}{\alpha_2 PERIOD_{it}} + \overset{-}{\alpha_3 SOFT_{it} \times PERIOD_{it}} \\ & + \overset{-}{\alpha_4 MV_{it}} + \overset{+}{\alpha_5 VOLATILITY_{it}} + \overset{-}{\alpha_6 LISTING_{it}} + \overset{-}{\alpha_7 PRICE_{it}} \\ & + \overset{-}{\alpha_8 FOLL_{it}} + \overset{-}{\alpha_9 TURNOVER_{it}} + v_{it} \end{aligned} \tag{1}$$

$$\begin{aligned} TURNOVER_{it} = {} & \beta_0 + \overset{?}{\beta_1 SOFT_{it}} + \overset{?}{\beta_2 PERIOD_{it}} + \beta_3 SOFT_{it} \\ & \overset{+}{\times PERIOD_{it}} + \overset{+}{\beta_4 MV_{it}} + \overset{+}{\beta_5 FOLL_{it}} + \overset{+}{\beta_6 SHROUT_{it}} \\ & + \overset{?}{\beta_7 SP500_{it}} + \overset{-}{\beta_8 SPREAD_{it}} + \omega_{it} \end{aligned} \tag{2}$$

where:

$SPREAD_{it}$ = annual average of the logarithm of the daily relative bid-ask spread, defined as the absolute value of the bid-ask spread divided by the average of bid and ask;
$SOFT_{it}$ = dummy variable that equals 1 if the firms is in the software industries, and 0 otherwise;
$PERIOD_{it}$ = dummy variable that equals 1 if year t falls in the period after SFAS No. 86 (i.e., 1986–1988), and 0 otherwise;
MV_{it} = logarithm of market capitalization as of fiscal year-end;
$VOLATILITY_{it}$ = logarithm of stock return volatility, defined as the standard deviation of daily stock returns of firm i in fiscal year t;
$LISTING_{it}$ = dummy variable that equals 1 if firm i is listed on NYSE or AMEX in fiscal year t, and 0 if it is listed on the NASDAQ;
$PRICE_{it}$ = annual average of the logarithm of daily stock price of firm i in fiscal year t;
$FOLL_{it}$ = logarithm of analyst following + 1;
$TURNOVER_{it}$ = annual average of the logarithm of daily turnover, defined as trading volume in shares divided by number of shares outstanding;
$SHROUT_{it}$ = annual average of the logarithm of daily number of shares outstanding; and
$SP500_{it}$ = dummy variable that equals 1 if firm i is included in the S&P 500 index in fiscal year t, and 0 otherwise.

The dummy variable *SOFT* captures the difference in the dependent variable between software firms and other high-tech firms before SFAS No. 86. The dummy variable *PERIOD* represents the change in the dependent variable for other high-tech firms after implementing SFAS No. 86. The interaction term $SOFT \times PERIOD$ captures the difference in the change in the dependent variable between software firms and other high-tech firms. A positive (negative) sign on this interaction term means that the dependent variable increases (decreases) for software firms relative to other high-tech firms after introduction of SFAS No. 86. Since I hypothesize that information asymmetry declines for software firms relative to other high-tech firms after introduction of SFAS No. 86, the expected sign on the interaction term is negative in Equation (1) and positive in Equation (2). A decline in information asymmetry for software firms relative to other high-tech firms will show up in a relative decline (increase) in the bid-ask spread (share turnover).

Capitalizers versus Expensers

I perform the analyses for capitalizers versus expensers over the period after SFAS No. 86 by estimating the following regressions:

$$\begin{aligned} SPREAD_{it} = {} & \gamma_0 + \overset{-}{\gamma_1} CAPITAL_{it} + \overset{-}{\gamma_2} MV_{it} + \overset{+}{\gamma_3} VOLATILITY_{it} + \overset{-}{\gamma_4} LISTING_{it} \\ & + \overset{-}{\gamma_5} PRICE_{it} + \overset{-}{\gamma_6} FOLL_{it} + \overset{-}{\gamma_7} TURNOVER_{it} + \varepsilon_{it} \end{aligned} \tag{3}$$

$$\begin{aligned} TURNOVER_{it} = {} & \delta_0 + \overset{+}{\delta_1} CAPITAL_{it} + \overset{+}{\delta_2} MV_{it} + \overset{+}{\delta_3} FOLL_{it} + \overset{+}{\delta_4} SHROUT_{it} \\ & + \overset{?}{\delta_5} SP500_{it} + \overset{-}{\delta_6} SPREAD_{it} + \phi_{it} \end{aligned} \tag{4}$$

where *CAPITAL* is a dummy variable that equals 1 if the firm has capitalized at least some of its software development costs, and 0 otherwise.

Since firms choose whether to capitalize or expense software development costs, *CAPITAL* is endogenous in the above regressions. Additionally, the firm's choice to capitalize might not be independent of the dependent variable (i.e., *SPREAD* or *TURNOVER*). That is, firms with high information asymmetry might choose to capitalize to reduce their information asymmetry. In this case *CAPITAL* will be correlated with the error term in Equations (1) and (2), and the OLS estimate of γ_1 or δ_1 will be biased. I employ the 2SLS procedure to control for this endogeneity.[14] I regress *CAPITAL* against factors that determine choice, and then use the fitted values from this regression in the second stage. Aboody and Lev (1998) suggest that size, profitability, R&D intensity, leverage, and systematic risk are related to the firms' choice to capitalize. Large and profitable firms are less likely to capitalize, while firms with high R&D intensity, leverage, and risk are more likely to capitalize. Therefore, I estimate Equation (3) as follows:

$$\begin{aligned}\Pr(CAPITAL_{it} = 1) = \alpha_0 + \alpha_1 \overset{-}{MV_{it}} + \alpha_2 \overset{-}{INCOME_{it}} + \alpha_3 \overset{+}{DEVINT_{it}} \\ + \alpha_4 \overset{+}{LEVERAGE_{it}} + \alpha_5 \overset{+}{BETA_{it}} + \omega_{it}\end{aligned} \tag{5}$$

where:

$CAPITAL_{it}$ = dummy variable that equals 1 if the firm has capitalized part of or all its software development costs, and 0 otherwise;
MV_{it} = logarithm of market value as of fiscal year-end;
$INCOME_{it}$ = net income adjusted for capitalizing software development costs (i.e., net income plus software development capital minus capitalized software), scaled by sales;
$DEVINT_{it}$ = R&D expense plus capitalized software, scaled by sales;
$LEVERAGE_{it}$ = long-term debt divided by the sum of equity and long-term debt; and
$BETA_{it}$ = market model estimate of beta over 100 days before fiscal year-end.

To examine whether the magnitude of capitalized software costs is related to information asymmetry, I estimate Equations (3) and (4) with *CAPINT* instead of *CAPITAL*. *CAPINT* is the capitalization intensity of software development costs, defined as capitalized software development costs divided by the sum of capitalized software development costs and research and development expense. To control for endogeneity, I estimate an OLS regression version of Equation (5) with *CAPINT* as the dependent variables, and then use the fitted value of *CAPINT* in Equations (3) and (4).

V. RESULTS

Software versus other High-Tech Firms

Table 3 presents mean values of relative bid-ask spread, share turnover, and regression control variables before and after SFAS No. 86 and the change around SFAS No. 86. Before SFAS No. 86, the relative bid-ask spread for software firms of 5.98 percent is significantly higher than that for other high-tech firms of 4.81 percent (p-value < 0.10). After SFAS

---

[14] Aboody and Lev (1998) employ a similar procedure.

TABLE 3
Means for Bid-Ask Spread, Share Turnover, and Control Variables for Sample Firms
(n = 67 software firms, 448 other high-tech firms)

Variable	Other[b]	Software[b]	t-value[c]
Panel A: Before SFAS No. 86[a]			
SPREAD	4.81	5.98	1.67*
TURNOVER	0.43	0.36	1.46
SHROUT (millions)	120.00	91.10	0.40
PRICE	11.50	7.75	2.20**
MV (millions)	645.00	90.60	2.74***
VOLATILITY	0.03	0.03	0.17
FOLL	3.89	2.85	1.56
Panel B: After SFAS No. 86			
SPREAD	6.04	6.55	0.74
TURNOVER	0.43	0.43	0.09
SHROUT (millions)	120.00	101.00	0.22
PRICE	9.40	7.52	1.82*
MV (millions)	851.00	180.00	3.12***
VOLATILITY	0.04	0.04	0.43
FOLL	4.51	4.12	0.41
Panel C: Change (after minus before SFAS No. 86)			
SPREAD	1.23	0.57	1.07
TURNOVER	0.00	0.07	1.60
SHROUT (millions)	0.00	9.90	1.24
PRICE	−2.10	−0.23	1.49
MV (millions)	206.00	89.40	1.63
VOLATILITY	0.01	0.01	0.68
FOLL	0.61	1.27	1.26

*,**,*** Denote significance (two-tailed test) at a probability level below 0.10, 0.05, and 0.01, respectively.
[a] Before SFAS No. 86 is the fiscal years 1983–1985, and after SFAS No. 86 is the fiscal years 1986–1988.
[b] Software is firms in the software industries (four-digit SIC codes 7370–7374). Other is firms in other high-tech industries (three-digit SIC codes: 283, 357, 360–368, 481, 7375–7379, and 873).
[c] t-value of the difference between software and other high-tech firms.

SPREAD = average of the daily relative bid-ask spread, defined as the absolute value of the bid-ask spread divided by the average of bid and ask;
TURNOVER = average of daily turnover, defined as trading volume in shares divided by number of shares outstanding;
SHROUT = average of daily number of shares outstanding;
PRICE = average of daily stock price, adjusted for stock splits and stock dividends;
MV = market capitalization in millions of dollars as of fiscal year-end;
VOLATILITY = stock return volatility, defined as the standard deviation of daily stock returns; and
FOLL = number of financial analysts issuing a one-year-ahead earnings forecast as of the fiscal year-end.

No. 86, the difference in relative-bid ask spread between the two groups is insignificant. The differences in share turnover between the two groups are insignificant before and after SFAS No. 86. Changes in the proxies for information asymmetry are indistinguishable between the two groups. Univariate results do not support any differences in the changes in information asymmetry after software firms have adopted SFAS No. 86. As seen next, however, multivariate results depict a different picture.

Table 4 reports the regression results for estimating relative bid-ask spread and share turnover regressions.[15] For each dependent variable, I report a basic OLS regression without control variables to serve as a benchmark against the 2SLS regression with control variables. The first (second) column reports coefficient estimates and t-values for the relative bid-ask spread regression without (with) control variables. The third (fourth) column reports coefficient estimates and t-values for the turnover regression without (with) control variables. The signs and the significance of the test variables in the basic regressions are similar to those in the full regressions. Therefore, the following discussion will be based on full regressions.

The relative bid-ask spread (share turnover) regression explains about 79 (29) percent of the variation in relative bid-ask spread (share turnover), and most variables have their expected signs. The only exception in the *SPREAD* regression is share turnover (*TURNOVER*), which is positive and significant. The exceptions in the *TURNOVER* regression are number of shares outstanding (*SHROUT*), which is negative and significant, and bid-ask spread (*SPREAD*), which is positive and significant.

The coefficient of *SOFT* in the *SPREAD* regression is positive and significant, indicating that software firms have higher relative bid-ask spread before SFAS No. 86. The significant negative coefficient of *SOFT* in the *TURNOVER* regression also indicates that before SFAS No. 86 software firms have lower share turnover than do other high-tech firms. Both results suggest that software firms have higher information asymmetry than other high-tech firms before SFAS No. 86. The coefficient of *PERIOD* is insignificant in both regressions, suggesting no change in *SPREAD* and *TURNOVER* for other high-tech firms.

The coefficient of *SOFT* × *PERIOD* in the *SPREAD* regression is negative and significant, suggesting that the change in relative bid-ask spread for software firms is significantly less than that for other high-tech firms. The coefficient of the same interaction term is positive and significant in the *TURNOVER* regression, indicating that the change in share turnover is significantly greater for software firms than for other high-tech firms. Both results indicate a decline in information asymmetry for software firms relative to other high-tech firms.

Economic Significance of the Results

Since the regressions are in the log-linear format, the coefficients are interpreted as elasticities. That is, the percentage change in the dependent variable given the percentage change in the independent variable.[16] The coefficient of *PERIOD* represents the percentage changes in the dependent variable for other high-tech firms after the adoption of SFAS No. 86. The sum of the coefficients of *PERIOD* and *SOFT* × *PERIOD* represents the percentage change in the dependent variable for software firms after SFAS No. 86 (incremental to the non-software firms, because *SOFT* is a binary interactive variable). The results are economically significant. The total daily bid-ask spread decreases by about $900,000 for software firms after the adoption of SFAS No. 86.[17] The average daily turnover increases by 27.5

---

[15] Results of linear regressions in this study exclude influential observations with an absolute value of r-student greater than 2.

[16] This analysis is analogous to that of Roulstone (2003, 569–570).

[17] The percentage change in the relative bid-ask spread for software (other high-tech) firms is –18.3 (1.5) percent. The change in the daily total bid-ask spread is the percentage change in relative bid-ask spread multiplied by both price and the average daily trading volume in shares.

percent for software firms. The economic magnitudes for the changes in bid-ask spread and share turnover for other high-tech are negligible because of the smaller magnitude and the insignificance of *PERIOD* in both regressions.

TABLE 4
Regressions of Bid-Ask Spread and Share Turnover

Variable[c]	**Predicted Sign**	***SPREAD***[a]		***TURNOVER***[b]	
Intercept		−3.429	3.088	−6.295	−8.225
		(221.24)***	(5.81)***	(318.44)***	(48.40)***
SOFT	?/?	0.253	0.181	−0.213	−0.285
		(5.53)***	(6.05)***	(3.68)***	(5.57)***
PERIOD	?/?	0.163	−0.015	0.085	−0.003
		(7.56)***	(1.37)	(3.10)***	(0.14)
SOFT × *PERIOD*	−/+	−0.151	−0.168	0.195	0.278
		(2.46)**	(5.01)***	(2.49)**	(4.07)***
MV	−/+	—	−0.087	—	0.420
		—	(8.63)***	—	(25.37)***
VOLATILITY	+	—	0.651	—	—
		—	(17.67)***	—	—
LISTING	−	—	−0.082	—	—
		—	(3.25)***	—	—
PRICE	−	—	−0.096	—	—
		—	(11.07)***	—	—
FOLL	−/+	—	−0.061	—	0.092
		—	(4.67)***	—	(6.68)***
TURNOVER	−	—	0.378	—	—
		—	(5.06)***	—	—
SHROUT	+	—	—	—	−0.156
		—	—	—	(11.97)***
SP500	?	—	—	—	−0.127
		—	—	—	(2.52)**
SPREAD	−	—	—	—	0.935
		—	—	—	(23.62)***
n		2,736	2,732	2,761	2,779
Adjusted R^2		0.0308	0.7877	0.0101	0.2941

---

t-values are in the parentheses below coefficient estimates and *,**,*** denote significance (two-tailed test) at a probability level below 0.10, 0.05, and 0.01, respectively.

[a] The *SPREAD* regression is:

$$SPREAD_{it} = \alpha_0 + \overset{?}{\alpha_1 SOFT_{it}} + \overset{?}{\alpha_2 PERIOD_{it}} + \overset{-}{\alpha_3 SOFT_{it} \times PERIOD_{it}} + \overset{-}{\alpha_4 MV_{it}} + \overset{+}{\alpha_5 VOLATILITY_{it}}$$

$$+ \overset{-}{\alpha_6 LISTING_{it}} + \overset{-}{\alpha_7 PRICE_{it}} + \overset{-}{\alpha_8 FOLL_{it}} + \overset{-}{\alpha_9 TURNOVER_{it}} + \upsilon_{it}$$

[b] The *TURNOVER* regression is:

$$TURNOVER_{it} = \beta_0 + \overset{?}{\beta_1 SOFT_{it}} + \overset{?}{\beta_2 PERIOD_{it}} + \overset{+}{\beta_3 SOFT_{it} \times PERIOD_{it}} + \overset{+}{\beta_4 MV_{it}}$$

$$+ \overset{+}{\beta_5 FOLL_{it}} + \overset{+}{\beta_6 SHROUT_{it}} + \overset{?}{\beta_7 SP500_{it}} + \overset{-}{\beta_8 SPREAD_{it}} + \omega_{it}$$

(*continued on next page*)

TABLE 4 (Continued)

[c] Variables definitions:

$SPREAD_{it}$ = annual average of the logarithm of the daily relative bid-ask spread, defined as the absolute value of the bid-ask spread divided by the average of bid and ask;
$SOFT_{it}$ = dummy variable that equals 1 if the firm is the software industries, and 0 otherwise;
$PERIOD_{it}$ = dummy variable that equals 1 if year t falls in the period after SFAS No. 86 (i.e., 1986–1988), and 0 otherwise;
MV_{it} = logarithm of market capitalization as of fiscal year-end;
$VOLATILITY_{it}$ = logarithm of stock return volatility, defined as the standard deviation of daily stock returns of firm i in fiscal year t:
$LISTING_{it}$ = dummy variable that equals 1 if firm i is listed on NYSE or AMEX in fiscal year t, and 0 if it is listed on the NASDAQ,
$PRICE_{it}$ = annual average of the logarithm of daily stock price of firm i in fiscal year t,
$FOLL_{it}$ = logarithm of analyst following + 1;
$TURNOVER_{it}$ = annual average of the logarithm of daily turnover, defined as trading volume in shares divided by number of shares outstanding for firm i in fiscal year t;
$SHROUT_{it}$ = annual average of the logarithm of daily number of shares outstanding for firm i in fiscal year t; and
$SP500_{it}$ = dummy variable that equals 1 if firm i is included in the S&P 500 index in fiscal year t.

Spillover Effects

The results in Table 4 show that the change in the proxies for information asymmetry is consistent with a decline in information asymmetry for software firms relative to other high-tech firms. Since we observe an improvement in information asymmetry after the adoption of the new standards, do the benefits extend to all software firms, or do they mainly accrue to capitalizers? To answer this question, I estimate the results in Table 4 separately for capitalizers and expensers versus other high-tech firms.

To conserve space, Table 5 reports only the coefficients on *SOFT* × *PERIOD* from estimating Equations (1) and (2). In "Capitalizers versus other High-Tech," the software sample consists of only firms that capitalized in all years after SFAS No. 86. In "Expensers versus other High-Tech," the software sample consists of firms that have not capitalized at all after SFAS No. 86. The interaction term *SOFT* × *PERIOD* is negative (positive) and significant in the *SPREAD* (*TURNOVER*) regression regardless of whether software firms consist of only capitalizers or only expensers. The results suggest that the improvement in information asymmetry for software firms accrues to both capitalizers and expensers.

Capitalizers versus Expensers

Table 6 represents the averages of bid-ask spread and turnover regressions variables for capitalizers and expensers. Univariate statistics provide mixed results about the difference in information asymmetry between capitalizers as expensers. Whereas the bid-ask spread is significantly greater for capitalizers (p-value < 0.05), indicating higher information asymmetry for capitalizers, the share turnover is significantly lower for expensers (p-value < 0.10), suggesting higher information asymmetry for expensers. Capitalizers are larger than expensers as the difference in market value is significant (p-value < 0.01). Although the difference in *VOLATILITY* between capitalizers and expensers is statistically significant, the magnitude is too small to be economically significant.

The results of estimating Equations (3) and (4) are reported in Table 7. For each regression, I report the results using the fitted values of *CAPITAL* and *CAPINT* separately. The *SPREAD* (*TURNOVER*) regression explains about 85 (61) percent of the variation in the dependent variable. The signs and significance of most control variables in these regressions are as predicted. The exceptions are *TURNOVER* in the *SPREAD* regression, and *SHROUT* and *SPREAD* in the *TURNOVER* regression.

TABLE 5
The Impact of SFAS No. 86 on Information Asymmetry for Capitalizers and Expensers versus other High-Tech Firms

Sample	*SPREAD*[a]	*TURNOVER*[b]
Full Sample (from table 4)	−0.168 (5.01)***	0.278 (4.07)***
Capitalizers versus other High-Tech	−0.139 (1.89)*	0.549 (4.33)***
Expensers versus other High-Tech	−0.143 (2.73)***	0.342 (2.83)***

t-values are in the parentheses below coefficient estimates and *,**,*** denote significance (two-tailed test) at a probability level below 0.10, 0.05, and 0.01, respectively.

[a] The *SPREAD* regression is:

$$SPREAD_{it} = \alpha_0 + \overset{?}{\alpha_1 SOFT_{it}} + \overset{?}{\alpha_2 PERIOD_{it}} + \overset{-}{\alpha_3 SOFT_{it} \times PERIOD_{it}} + \overset{-}{\alpha_4 MV_{it}} + \overset{+}{\alpha_5 VOLATILITY_{it}}$$
$$+ \overset{-}{\alpha_6 LISTING_{it}} + \overset{-}{\alpha_7 PRICE_{it}} + \overset{-}{\alpha_8 FOLL_{it}} + \overset{-}{\alpha_9 TURNOVER_{it}} + \upsilon_{it}$$

[b] The *TURNOVER* regression is:

$$TURNOVER_{it} = \beta_0 + \overset{?}{\beta_1 SOFT_{it}} + \overset{?}{\beta_2 PERIOD_{it}} + \overset{+}{\beta_3 SOFT_{it} \times PERIOD_{it}} + \overset{+}{\beta_4 MV_{it}}$$
$$+ \overset{+}{\beta_5 FOLL_{it}} + \overset{+}{\beta_6 SHROUT_{it}} + \overset{?}{\beta_7 SP500_{it}} + \beta_8 SPREAD_{it} + \omega_{it}$$

See Table 4 for variable definitions.
The above table reports only the coefficients of *SOFT* × *PERIOD* in each regression. In "Capitalizers versus other High-Tech," software sample includes only capitalizers. In "Expensers versus other High-Tech," software sample includes only expensers.

Both *CAPITAL* and *CAPINT* are significant and negative (positive) in the *SPREAD* (*TURNOVER*) regressions, suggesting that capitalizers have lower (higher) bid-ask spread (share turnover) than expensers. This result is consistent with information asymmetry for capitalizers being lower than that for expensers.[18] The coefficient of *CAPITAL* in the *SPREAD* regression indicates that the relative bid-ask spread for capitalizers is about 8 percent lower than that for expensers. Similarly, the share turnover for capitalizers is about 15 percent greater than that for expensers. The coefficient of *CAPINT* in the *SPREAD* (*TURNOVER*) regression shows that an increase of 1 percent in amount of software development capitalized would result in a (an) decrease (increase) in bid-ask spread (share turnover) of 0.8 (1.3) percent.

VI. CONCLUSION

Many studies criticize the asymmetry of the accounting treatment of expensing investments in intangibles while capitalizing investments in physical assets (e.g., Aboody and

---

[18] This result appears inconsistent with the result reported in Table 5, where I conclude that improvement in information asymmetry accrues to both capitalizers and expensers. The result of this section is more reliable for two reasons. First, classification of capitalizers and expensers is finer in this section since firms are classified on a yearly basis, while in the previous section firms have the same classification for the whole period (see footnote 8). Second, as noted in footnote 8, the results in Table 5 are not robust to classification schemes. When I relax the classification of capitalizers to include firms that capitalized either at least once or more than half the years in the post-SFAS No. 86 period, the results indicate improvement in information asymmetry accrues more to capitalizers than expensers.

TABLE 6
Means for Bid-Ask Spread, Share Turnover, and Control Variables for Software Firms[a]

Variable	Expensers	Capitalizers	t-value[b]
SPREAD	4.73	5.72	2.29**
TURNOVER	0.45	0.56	1.67*
SHROUT (millions)	19.60	386.00	3.62***
PRICE	8.02	8.80	0.77
MV (millions)	150.00	913.00	3.43***
VOLATILITY	0.03	0.04	2.61***
FOLL	3.48	3.85	0.41

*,**,*** Denote significance (two-tailed test) at a probability level below 0.10, 0.05, and 0.01, respectively.

[a] The sample consists of 37 firms and 253 firm-year observations. I classify a software firm as a capitalizer if it capitalizes at least some of its software development costs after SFAS No. 86 and as an expenser if it expenses all its software development costs. Of the 37 firms, 19 capitalized software development costs in each year, ten expensed in each year, and eight expensed in some years and capitalized in others.

[b] t-value of the difference between capitalizers and expensers.

SPREAD = average of the daily relative bid-ask spread, defined as the absolute value of the bid-ask spread divided by the average of bid and ask;
TURNOVER = average of daily turnover, defined as trading volume in shares divided by number of shares outstanding;
SHROUT = average of daily number of shares outstanding;
PRICE = average of daily stock price, adjusted for stock splits and stock dividends;
MV = market capitalization in millions of dollars as of fiscal year-end;
VOLATILITY = stock return volatility, defined as the standard deviation of daily stock returns; and
FOLL = number of financial analysts issuing a one-year-ahead earnings forecast as of the fiscal year-end.

Lev 2000; Boone and Raman 2001; Lev et al. 2005). Both types of assets have future benefits, so expenditures for both of them should be capitalized. However, the uncertainty of the future benefits of intangibles is cited as the main justification for expensing them (FASB 1974; Kothari et al. 2002). Recent studies document relatively higher information asymmetry for intangible-intensive (e.g., R&D-intensive) firms (e.g., Aboody and Lev 2000; Barth and Kasznik 1999; Barth et al. 2001; Boone and Raman 2001), thus supporting the notion that failure to recognize intangibles in financial statements has adverse consequences.

My research examines the relation between accounting for internally generated intangibles and information asymmetry by analyzing the impact of SFAS No. 86, which allows capitalization of certain software development costs. Theory predicts that increased disclosure reduces information asymmetry. This theory may not hold in practice because increased disclosure, which can be either via voluntary disclosures or via recognizing intangibles, may not reduce information asymmetry. Voluntary disclosure is not as informative as recognition because disclosed amounts are not audited, and it is more costly to extract useful information from disclosures (Barth et al. 2003). Recognition may also fail to reduce information asymmetry if (1) firms do not have sufficient information to recognize the asset, (2) management exploits capitalization to manage earnings, or (3) management chooses not to capitalize even when it has successful investments. SFAS No. 86 is a setting well suited for examining whether capitalizing a certain class of intangibles (i.e., software development costs) reduces information asymmetry.

Using relative bid-ask spread and share turnover as proxies for information asymmetry, I find that after the introduction of SFAS No. 86, information asymmetry of software firms decreases relative to other high-tech firms. I also find that information asymmetry is significantly lower for capitalizers than for expensers. My findings suggest that the uncertainty of the future benefits of software development costs is not prohibitively high to impede recognition of a software development capital, and that practical impediments to reducing information asymmetry, such as opportunistic capitalization and the expensing of successful projects do not dampen the favorable impact SFAS No. 86 has on information asymmetry.

My findings are relevant to the debate of accounting for internally generated intangibles. Caution should be exercised, however, in generalizing my findings to all R&D expenditures.

TABLE 7
Two-Stage Least Square Regressions of Bid-Ask Spread and Share Turnover for Capitalizers and Expensers

		SPREAD[a]		*TURNOVER*[b]	
Variable[c]	**Predicted Sign**	***CAPITAL***	***CAPINT***	***CAPITAL***	***CAPINT***
Intercept		1.802 (4.68)***	1.822 (4.64)***	−7.605 (14.06)***	−7.854 (14.20)***
CAPITAL (*CAPINT*)	−/+	−0.082 (2.89)***	−0.008 (4.11)***	0.149 (1.98)**	0.013 (2.25)***
MV	−/+	−0.053 (4.22)***	−0.053 (4.16)***	0.440 (10.15)***	0.452 (10.54)***
VOLATILITY	+	0.894 (18.92)***	0.931 (20.21)***	— —	— —
LISTING	−	−0.211 (5.19)***	−0.184 (4.27)***	— —	— —
PRICE	−	−0.042 (3.08)***	−0.041 (3.02)***	— —	— —
FOLL	−/+	−0.050 (4.36)***	−0.040 (3.51)***	0.263 (7.01)***	0.263 (6.93)***
TURNOVER	−	0.141 (3.51)***	0.116 (3.03)***	— —	— —
SHROUT	+	— —	— —	−0.193 (5.19)***	−0.193 (5.16)***
SP500	?	— —	— —	0.548 (2.76)***	0.564 (2.81)***
SPREAD	−	— —	— —	1.126 (10.54)***	1.142 (10.77)***
n		240	241	240	240
Adjusted R²		0.8547	0.8550	0.6137	0.6076

---

t-values are in the parentheses below coefficient estimates and *,**, and *** denote significance (two-tailed test) at a probability level below 0.10, 0.05, and 0.01, respectively.

[a] The *SPREAD* regression is:

$$SPREAD_{it} = \gamma_0 + \overset{-}{\gamma_1 CAPITAL_{it}}\ (CAPINT_{it}) + \overset{-}{\gamma_2 MV_{it}} + \overset{+}{\gamma_3 VOLATILITY_{it}} + \overset{-}{\gamma_4 LISTING_{it}}$$
$$+ \overset{-}{\gamma_5 PRICE_{it}} + \overset{-}{\gamma_6 FOLL_{it}} + \overset{-}{\gamma_7 TURNOVER_{it}} + \varepsilon_{it}$$

[b] The *TURNOVER* regression is:

$$TURNOVER_{it} = \delta_0 + \overset{+}{\delta_1 CAPITAL_{it}}\ (CAPINT_{it}) + \overset{+}{\delta_2 MV_{it}} + \overset{+}{\delta_3 FOLL_{it}} + \overset{+}{\delta_4 SHROUT_{it}}$$
$$+ \overset{?}{\delta_5 SP500_{it}} + \overset{-}{\delta_6 SPREAD_{it}} + \phi_{it}$$

(*continued on next page*)

TABLE 7 (Continued)

[c] Variable definitions:

$CAPITAL_{it}$ ($CAPINT_{it}$) = fitted value of *CAPITAL* (*CAPINT*) from estimating capitalization choice;

$SPREAD_{it}$ = annual average of the logarithm of the daily relative bid-ask spread, defined as the absolute value of the bid-ask spread divided by the average of bid and ask, and 0 otherwise;

MV_{it} = logarithm of market capitalization as of fiscal year-end;

$VOLATILITY_{it}$ = logarithm of stock return volatility, defined as the standard deviation of daily stock returns of firm i in fiscal year t;

$LISTING_{it}$ = dummy variable that equals 1 if firm i is listed on NYSE or AMEX in fiscal year t, and 0 if it is listed on the NASDAQ;

$PRICE_{it}$ = annual average of the logarithm of daily stock price of firm i in fiscal year t;

$FOLL_{it}$ = logarithm of analyst following + 1;

$TURNOVER_{it}$ = annual average of the logarithm of daily turnover, defined as trading volume in shares divided by number of shares outstanding for firm i in fiscal year t;

$SHROUT_{it}$ = annual average of the logarithm of daily number of shares outstanding for firm i in fiscal year t; and

$SP500_{it}$ = dummy variable that equals 1 if firm i is included in the S&P 500 index in fiscal year t.

It is possible that FASB has allowed capitalization of software development costs because it is the one area where managers can reliably estimate the future payoffs. The nature of R&D expenditures varies from one industry to another. Future research can examine whether the uncertainty of the future payoffs of R&D varies by industry, and whether such variation can be linked to industry characteristics. Future research may also investigate the impact of management's contracting incentives on the relation documented here between capitalizing software development costs and information asymmetry. That is, given management's tendency to bias earnings in response to contracting incentives, does the market incorporate this bias into the proxies of information asymmetry? Is the relation between capitalization and information asymmetry proxies stronger in the absence of such incentives?

REFERENCES

Aboody, D., and B. Lev. 1998. The value relevance of intangibles: The case of software capitalization. *Journal of Accounting Research* 36 (Supplement): 161–191.

———, and ———. 2000. Information asymmetry, R&D, and insider gains. *The Journal of Finance* 55 (6): 2747–2766.

Association for Investment and Management Research (AIMR). 1993. *Financial Reporting in the 1990s and Beyond.* Charlottesville, VA: AIMR.

Atiase, R. K. 1985. Predisclosure information, firm capitalization, and security price behavior around earnings announcements. *Journal of Accounting Research* 23 (1): 21–36.

Barth, M. E., and R. Kasznik. 1999. Share repurchases and intangible assets. *Journal of Accounting and Economics* 28 (2): 211–241.

———, ———, and M. McNichols. 2001. Analyst coverage and intangible assets. *Journal of Accounting Research* 39: 1–34.

———, G. Clinch, and T. Shibano. 2003. Market effects of recognition and disclosure. *Journal of Accounting Research* 41 (4): 581–609.

Bessembinder, H., and H. M. Kaufman. 1997. A comparison of trade execution costs for NYSE and NASDAQ-listed stocks. *The Journal of Financial and Quantitative Analysis* 32 (3): 287–310.

Boone, J., and K. K. Raman. 2001. Off-balance sheet R&D assets and market liquidity. *Journal of Accounting and Public Policy* 20 (2): 97–128.

Brennan, M. J., and A. Subrahmanyam. 1995. Investment analysis and price formation in securities markets. *Journal of Financial Economics* 38 (3): 361–381.

Core, J. 2001. A review of the empirical disclosure literature: Discussion. *Journal of Accounting and Economics* 31 (1-3): 441–456.

Davey, M. J. 1992. Lowdown on high tech—What's what on the computer scene. *Barron's* (August 24): 18.

Diamond, D. W., and R. E. Verrecchia. 1991. Disclosure, liquidity, and the cost of capital. *The Journal of Finance* 45 (4): 1325–1359.

Easton, P., G. Taylor, P. Shroff, and T. Sougiannis. 2002. Using forecasts of earnings to simultaneously estimate growth and rate of return on equity investment. *Journal of Accounting Research* 40 (3): 657–676.

Financial Accounting Standards Board (FASB). 1974. *Accounting for Research and Development Costs.* SFAS No. 2. Stamford, CT: FASB.

———. 1977. *Financial Accounting and Reporting by Oil and Gas Producing Companies.* SFAS No. 19. Stamford, CT: FASB.

———. 1985. *Accounting for the Cost of Computer Software to be Sold, Leased, or Otherwise Marketed.* Vols. 1 and 2. SFAS No. 86. Stamford, CT: FASB.

Francis, J., and K. Schipper. 1999. Have financial statements lost their relevance? *Journal of Accounting Research* 37 (2): 319–352.

Gebhardt, W. R., C. M. C. Lee, and B. Swaminathan. 2001. Toward an implied cost of capital. *Journal of Accounting Research* 39 (1): 135–176.

Healy, P. M., S. C. Myers, and C. D. Howe. 2002. R&D accounting and the tradeoff between relevance and objectivity. *Journal of Accounting Research* 40 (3): 677–710.

Kothari, S. P., T. E. Laguerre, and A. J. Leone. 2002. Capitalization versus expensing: Evidence on the uncertainty of future earnings from current investments in PP&E versus R&D. *Review of Accounting Studies* 7 (4): 355–382.

Leuz, C., and R. E. Verrecchia. 2000. The economic consequences of increased disclosure. *Journal of Accounting Research* 38 (Supplement): 91–124.

Lev, B., and T. Sougiannis. 1996. The capitalization, amortization, and value-relevance of R&D. *Journal of Accounting and Economics* 21 (1): 107–138.

———, and P. Zarowin. 1999. The boundaries of financial reporting and how to extend them. *Journal of Accounting Research* 37 (Supplement): 353–385.

———, B. Sarath, and T. Sougiannis. 2005. R&D reporting biases and their consequences. *Contemporary Accounting Research* 22 (4).

Levitt, A. 1998. The importance of high-quality accounting standards. *Accounting Horizons* 12 (1): 79–82.

Roulstone, D. T. 2003. Analyst following and market liquidity. *Contemporary Accounting Research* 20 (3): 551–570.

Stoll, H. R. 1978. The pricing of security dealer services: An empirical study of NASDAQ stocks. *The Journal of Finance* 33 (4): 1153–1172.

Tkac, P. A. 1999. A trading volume benchmark: Theory and evidence. *Journal of Financial and Quantitative Analysis* 34 (1): 89–114.

Watts, R. L., and J. L. Zimmerman. 1986. Positive accounting theory. In *Contemporary Topics In Accounting Series*, edited by A. Rappaport. Eaglewood Cliffs, NJ: Prentice Hall, Inc.

THE ACCOUNTING REVIEW
Vol. 80, No. 4
2005
pp. 1233–1260

Credibility of Management Forecasts

Jonathan L. Rogers
University of Chicago

Phillip C. Stocken
Dartmouth College

ABSTRACT: We examine how the market's ability to assess the truthfulness of management earnings forecasts affects how managers bias their forecasts, and we evaluate whether the market's response to management forecasts is consistent with it identifying predictable forecast bias. We find managers' willingness to misrepresent their forward-looking information as a function of their incentives varies with the market's ability to detect misrepresentation. We examine incentives induced by the litigation environment, insider trading activities, firm financial distress, and industry concentration. With regard to the stock price response to forecasts, we find the market varies its response with the predictable bias in the forecast. The efficiency of the market's response, however, varies with the forecast news.

Keywords: *management forecast credibility; voluntary disclosure; management incentives; rational expectations.*

Data Availability: *Data are available from sources indicated in the text.*

I. INTRODUCTION

Managers have incentives to bias their earnings forecasts. However, they are constrained because investors can use the subsequent earnings report to assess whether they have misrepresented their information.[1] This paper examines how the market's ability to assess the truthfulness of management earnings forecasts affects whether managers bias their forecasts, and it evaluates whether the market's response to management forecasts is consistent with investors identifying predictable forecast bias.

In the first part of the paper, we develop a regression model that examines how forecast error (i.e., management forecast minus subsequent earnings realization) is affected by the

---

[1] Indeed, Lev and Penman (1990) argue that management forecasts are credible because investors can *ex post* verify a manager's forecast by comparing it with the audited earnings report.

We thank the Editor, two anonymous reviewers, Brian Bushee, Phil Berger, John Core, Gus De Franco, Amy Hutton, Chris Ittner, Dave Larcker, Christian Leuz, David Mest, Karen Nelson, Shiva Sivaramakrishnan, Irem Tuna, Ro Verrecchia, and workshop participants at the University of Houston, University of Pennsylvania, Rice University, 2002 American Accounting Association Annual Meetings, and the 2003 European Accounting Association Meetings for helpful comments. We also gratefully acknowledge financial support from the Rodney L. White Center for Financial Research and thank First Call for providing data used in this study.

Editor's note: This paper was accepted by Larry Brown.

Submitted April 2003
Accepted March 2005

managers' incentives coupled with a proxy for the market's ability to detect manager misrepresentation. We consider incentives induced by the litigation environment, insider transactions, firm financial condition, and industry concentration. We apply factor analysis to several indicator variables to identify a latent construct that measures the difficulty market participants experience with using the earnings report to detect manager misrepresentation. Our primary finding in this part of the paper is that the willingness of managers to misrepresent their information in response to their incentives varies with the market's ability to detect their misrepresentation. More specifically, we find: First, managers' incentives to misrepresent their information caused by the threat of litigation is a function of the difficulty market participants experience in detecting manager misrepresentation. Second, managers' incentives to offer forecasts that increase their profits from insider transactions are attenuated by the market's ability to detect misleading forecasts. Third, when it is more difficult to assess the credibility of forecasts, managers of financially distressed firms issue forecasts that are more optimistic than managers of healthy firms. Fourth, when it is more difficult to assess the credibility of forecasts, managers of firms in concentrated industries issue forecasts that are more pessimistic than those in less concentrated industries.

In the second part of the paper, we examine whether the market's response to management forecasts is consistent with it identifying the predictable bias in the forecasts. Using the regression model that explains forecast bias developed in the first part of the paper, we predict the bias in a forecast. We expect investors to filter out the predicted bias in the forecast news (i.e., management forecast minus consensus analyst forecast). We find that the market predicts and filters bias from management earnings forecasts, and that the efficiency of the market's response varies with the forecast news.

Historically, firms were reluctant to release forecasts despite several Securities and Exchange Commission (SEC) pronouncements encouraging their release. Firms typically viewed the safe-harbor provision that sheltered them from litigation arising from unattained projections in SEC filings as being inadequate (Penman 1980; Pownall and Waymire 1989). More recently, Congress enacted the Private Securities Litigation Reform Act of 1995 (PSLR Act) to strengthen the safe-harbor provision by restricting management's liability to forward-looking statements not offered in good faith. Although this legislation was widely welcomed, opponents vigorously contested it, claiming it would reduce the credibility of management forecasts and provide firms with a "license to lie" (Grundfest and Perino 1997a).

Our study is important for policymakers, securities regulators, investors, and academics for two key reasons. First, we develop and test hypotheses about the relation between managements' incentives to bias their forecasts and the difficulty investors face when evaluating managements' representations. We establish that managers self-servingly manipulate their forecasts in subtle ways: managers issue forecasts that are not only biased, but they are more likely to bias their forecasts when it is more difficult for investors to detect that they have misrepresented their information.[2] Our findings suggest extant market forces are insufficient to deter managers from offering self-serving forecasts.

Second, we evaluate whether the market's assessment of forecast credibility is appropriate, given our prediction of forecast bias. Prior studies use stock returns or analyst forecast revisions to infer forecast credibility (e.g., Jennings 1987; Williams 1996). These studies note investors or analysts are more responsive to bad news forecasts than good news forecasts, and conclude bad news is more credible than good news. These studies have not established, however, whether bad news is less biased than good news. We develop a measure of expected forecast error, and thus can evaluate the appropriateness of the market's response to a forecast. We find investors often interpret bad news as being more credible than good news even though we do not find bad news is unbiased or even less biased than good news. This result suggests that bad news forecasts, which tend to be optimistic, should be viewed skeptically and not simply taken at face value.

---

[2] Extant evidence regarding the presence of forecast bias is mixed: several recent studies (which focus on forecasts mostly issued prior to the period we examine) find that management forecasts are unbiased on average (e.g., McNichols 1989; Frankel et al. 1995; Kasznik 1999; Johnson et al. 2001). However, Choi and Ziebart (2000) find mixed evidence of average forecast bias. Koch (2002) finds that distressed firms issue optimistic forecasts.

The observed differential stock price response to good and bad news is reminiscent of McNichols (1989), a primary antecedent of this paper. Obtaining weak evidence of bias in management forecasts, she concludes the correlation between the stock price response and management forecast errors is more likely attributable to investors having information unavailable to managers than it is to management forecasting bias. Given our finding that managers bias their forecasts, we show that the differential stock price response to good and bad news management forecasts is consistent with investors responding to forecast bias. The fact that we find evidence of forecast bias, in contrast to McNichols (1989), might be attributable to changes in the regulatory environment: our sample covers a period after enactment of the PSLR Act. Accordingly, our results may be sensitive to changes in the regulatory environment following implementation of Regulation Fair Disclosure and enactment of the Sarbanes-Oxley Act.

The rest of the paper proceeds as follows: Section II develops the hypotheses; Section III describes the sample; Section IV specifies the research design and discusses the results; and Section V summarizes and concludes.

II. HYPOTHESIS DEVELOPMENT

The "expectations adjustment hypothesis" posits that managers issue forecasts to align investors' expectations with their own (Ajinkya and Gift 1984; Hassell and Jennings 1986). At times, however, managers might benefit from issuing forecasts that mislead investors. Nevertheless, managers are constrained because investors can use the subsequent audited earnings report and information from other sources to evaluate the earlier forecast. If the market detects misrepresentation, then management's reputation might be damaged and management might suffer legal censure.

Theoretical studies have examined managers' forecasting behavior when investors can use a subsequent earnings report to assess a forecast's credibility. Sansing (1992) shows in a single-period game that the presence of an earnings report is sufficient to ensure a manager will *partially* reveal his information. Stocken (2000) establishes in a multi-period game that a manager will *fully* reveal information provided, among other conditions, the earnings report is sufficiently useful for assessing the credibility of the manager's voluntary disclosure.

The usefulness of an earnings report for assessing the credibility of a management earnings forecast varies with the difficulty of accurately predicting earnings. Absent strategic incentives, a manager should predict earnings more accurately when there is little uncertainty about the firm's earnings. In this case, it is less difficult for investors and competitors to assess the truthfulness of the manager's forecast. In contrast, when a firm's earnings vary drastically as its circumstances change, it is more difficult for a manager to accurately forecast earnings, and therefore, more difficult for investors to evaluate the truthfulness of the manager's forecast. Recognizing this notion as a key feature of the forecasting environment, we apply factor analysis to several indicator variables to identify a latent construct that reflects the difficulty market participants experience detecting manager misrepresentation. We then examine how this latent construct, which we term "forecasting difficulty," influences managers' willingness to offer misleading forecasts. We expect an increase in the market participants' ability to detect misrepresentation to reduce managers' willingness to bias their forecasts.

Management Incentives and Forecasting Bias

We consider the effect of a firm's litigation environment, insider transactions, financial condition, and competitive environment on management earnings forecasts conditional on the fact that management has decided to forecast.

Litigation Environment

The U.S. litigation environment imposes an asymmetric loss function on firms in the sense that a firm is more likely to be sued when there is a large negative return at its earnings announcement (Skinner 1994; Kasznik and Lev 1995). This loss function may encourage firms to forecast less optimistically or more pessimistically than they would in the absence of the threat of litigation. For instance, Francis et al. (1994) find no shareholder lawsuits alleging pessimistic forward-looking information or omissions of favorable forward-looking information.

However, the threat of litigation is less likely to deter managers from forecasting optimistically when it is more difficult to successfully sue them for issuing misleading forecasts. The PSLR Act provides a statutory safe-harbor to shelter managers from litigation arising from unattained forecasts. To expose the manager to penalties under the antifraud provisions of Section 10(b) of the Securities Exchange Act of 1934 and the SEC promulgated Rule 10b-5, a plaintiff must establish that a manager's forecast was made with actual knowledge that it was false or misleading. It is more onerous for plaintiffs to successfully litigate when it is more difficult to detect misrepresentation. In this light, our directional hypothesis is:[3]

> **H1a:** Managers of firms more likely to face litigation issue less optimistic or more pessimistic forecasts than managers less likely to face litigation, and this bias is attenuated when it is more difficult for investors to detect misrepresentation.

Insider Transactions

Managers, in anticipation of transacting in their firms' shares, may wish to release forecasts that are deliberately misleading to profitably exploit the stock mispricing these forecasts might induce. In particular, we expect managers to have incentives to issue optimistic forecasts in anticipation of disposing of stock or options and pessimistic forecasts in anticipation of acquiring stock or options. Such behavior violates the U.S. securities laws governing the release of forward-looking statements and insider trading (see Arshadi 1998). Consequently, we expect that managers will misrepresent their information only when it is difficult for the market to detect they have done so. Therefore, our directional hypothesis is:

> **H1b:** When it is more difficult for investors to detect misrepresentation, managers issue more optimistic forecasts before disposing of stock and more pessimistic forecasts before acquiring stock or options.

---

[3] All hypotheses are stated in the alternative form.

Financial Distress

Managers' incentives to issue misleading forecasts vary with their firms' financial conditions. For instance, providing encouraging news may convince investors that they should continue to employ managers whose business plans will restore their firms to financial health.[4] Therefore, when firms are financially distressed, we expect managers to be more inclined to issue optimistic forecasts. Whether managers of distressed firms issue optimistic forecasts, however, is affected by investors' ability to assess forecast truthfulness. Hence, our directional hypothesis is:

> **H1c:** When it is more difficult for investors to detect misrepresentation, managers of firms in poorer financial health issue more optimistic forecasts.

Competitive Environment

Firms in more concentrated industries are more profitable than firms in less concentrated industries (Tirole 1993). Consequently, managers of firms in more concentrated industries are expected to have greater incentives to discourage entry by offering pessimistic forecasts than managers of firms in less concentrated industries (Newman and Sansing 1993). Whether or not managers release pessimistic forecasts, however, is affected by their competitors' ability to assess the credibility of the forecasts. Our directional hypothesis is:

> **H1d:** When it is more difficult for potential competitors to detect misrepresentation, managers of firms in concentrated industries issue more pessimistic forecasts.

Management Incentives and Market Price Response

In an environment where investors hold rational expectations, we expect investors to identify a firm manager's forecasting incentives and adjust for the expected forecast bias when determining the firm's stock price.[5] In particular, if investors believe a forecast overstates expected earnings or is optimistic, then we expect a less positive response to the forecast; conversely, if investors believe a forecast understates expected earnings or is pessimistic, then we expect a more positive response to the forecast. In short, we expect investors to filter out, at least partially, the predicted forecast bias. This argument yields the directional hypothesis:

> **H2:** Investors respond less positively (or more negatively) to forecasts with higher predicted optimism and more positively (or less negatively) to forecasts with higher predicted pessimism.

III. SAMPLE AND DESCRIPTIVE STATISTICS

The legal environment affects management forecasting behavior (Baginski et al. 2002). Consequently, we restrict our sample to management earnings forecasts in the First Call Historical Database issued after the enactment of the PSLR Act on December 22, 1995 but before the passing of the SEC's Regulation Fair Disclosure on October 23, 2000. The PSLR Act, which shelters managers from litigation arising from unattained forward-looking statements, lowered the expected litigation costs associated with unattained forecasts (Johnson et al. 2001). Early evidence suggests that Regulation Fair Disclosure affects voluntary disclosure practices (Heflin et al. 2003).

---

[4] Other incentives encouraging managers of financial distressed firms to issue optimistic forecasts include reducing the probability of bankruptcy, acquisition, or hostile takeover (Frost 1997).

[5] In a rational expectations equilibrium, Fischer and Verrecchia (2000) establish that managers will bias their forecasts, and can benefit from doing so, even though investors adjust for the expected forecast bias.

Management earnings forecasts are offered with varying levels of specificity (e.g., point, range, open-ended, and qualitative). Investors can better assess the credibility of a forecast when they can unambiguously compare the forecast to the realized earnings.[6] Therefore, we include point and range earnings forecasts only.[7]

For each fiscal year-end, we include the first management forecast of annual earnings per share (EPS) reported in the First Call Historical Database. We consider the first forecast of annual earnings rather than updated annual forecasts or quarterly forecasts because the first annual forecast is associated with a longer horizon between the forecast release date and the earnings announcement. A longer horizon lengthens the period over which a manager can benefit from issuing a misleading forecast and accordingly heightens the need for investors to assess the forecast's credibility.

It might be argued that restricting the sample to the first forecast that a firm issues favors finding *ex post* forecast bias because this restriction ignores subsequently revised forecasts that are likely to be more accurate. However, in the absence of managers' incentives to misrepresent information, forecasts should be *unbiased* on average, even when issued well in advance of the earnings announcement.

To focus on earnings forecasts rather than earnings pre-announcements, we eliminate forecasts issued on or after the fiscal year-end. To mitigate the small denominator problem associated with using price as a deflator, we exclude firms with pre-release share prices under $2.00. To implement Ohlson's (1980) measure of financial distress, we exclude utilities, transportation companies, and financial services companies. We also exclude companies with insufficient data on the Compustat, CRSP, and NYSE Trade and Quote (TAQ) databases. The sample selection procedures, summarized in Table 1, yield a final sample of 595 firms with 925 firm-year observations (466 point and 459 range estimates).

Table 2 describes the distribution of management forecasts. The majority of firms (63 percent) issue a forecast in only one of the five years (Panel A). Forecasts are issued most frequently in the 1998 calendar year (Panel B). While the majority of forecasts are issued for firms that have December year-ends (Panel C), forecasts are released fairly evenly throughout the year (Panel D). Further, the sample represents a diverse cross-section of industries: no single four-digit SIC code accounts for more than 5 percent of our sample.

TABLE 1
Sample Selection and Data Requirements

Point or range estimates of annual EPS per First Call		3,417
Less: Number of duplicate forecasts for same fiscal year-end	(953)	
Forecasts issued less than one day prior to fiscal year-end	(392)	
Firms with insufficient data on CRSP or Compustat or TAQ	(824)	
Utilities, transportation companies, or financial services companies	(251)	
Firms with less than three analysts	(72)	
Sample for testing hypotheses		925

---

[6] In an experimental study, Hirst et al. (1999) find that management forecast specificity and prior forecast accuracy affect the confidence of investors' judgment about a firm's earnings.

[7] We acknowledge these types of forecasts exclude a substantial proportion of management forecasts; see Pownall et al. (1993) and Bamber and Cheon (1998).

Table 3 reports descriptive statistics for the sample. Variables are defined in Appendix A. Consensus analyst forecasts (prevailing when the management forecast is released) and management forecasts are significantly optimistic on average (p-value < .01 for Student's t-test and Wilcoxon signed ranked test). In addition, management forecasts are issued 237

TABLE 2
Distributional Properties of Management Forecasts

Panel A: Number of Forecasts per Firm

Number of Forecasts Per Firm	Number of Firms
1	377
2	140
3	51
4	20
5	7
	595

Panel B: Number of Forecasts per Year

Year	Forecasts per Year
1996	120
1997	157
1998	293
1999	199
2000	156
	925

Panel C: Monthly Distribution of Fiscal Year-Ends

Month of Fiscal Year-End	Number of Forecasts
January	61
February	20
March	33
April	14
May	23
June	56
July	20
August	18
September	59
October	21
November	5
December	595
	925

(*continued on next page*)

TABLE 2 (Continued)

Panel D: Monthly Distribution of Forecast Release Dates

Month of Forecast Release	Number of Forecasts
January	113
February	96
March	66
April	87
May	64
June	76
July	81
August	41
September	77
October	90
November	61
December	73
	925

Distributional properties for the sample of 925 point and range management earnings forecasts released in the years 1996 through 2000.

days prior to the fiscal year-end on average; this period seems sufficiently long to allow managers to benefit from forecasting in a self-serving fashion.

Table 4, Panel A, presents the correlation coefficients among management forecast news, management forecast errors, and analyst forecast errors (i.e., the difference between the most recent consensus analyst forecast prior to the management forecast release and the actual earnings). Consistent with the expectation adjustment hypothesis, we observe a significantly negative correlation between analyst forecast errors and forecast news. Table 4, Panels B and C provide the correlations for the independent variables used to test our hypotheses.

IV. HYPOTHESIS TESTING

In this section, we examine, first, the relation between management incentives and forecast errors, and second, the association between predicted forecast errors and the stock price response.

Research Design for Hypothesis 1

To examine the effect of manager incentives on forecast errors, we estimate the following model using a cross-sectional ordinary least squares (OLS) regression (firm and time subscripts have been suppressed):

$$\begin{aligned} FE = {} & \beta_1 Difficulty + \beta_2 Litigation + \beta_3 Litigation \times Difficulty + \beta_4 Inside\_Trade \\ & + \beta_5 Inside\_Trade \times Difficulty + \beta_6 Distress + \beta_7 Distress \times Difficulty \\ & + \beta_8 Concen + \beta_9 Concen \times Difficulty + Control\ variables + \varepsilon. \end{aligned} \quad (1)$$

The model's variables are defined and discussed below:

TABLE 3
Descriptive Statistics

Variable	Mean	Percentile 10%	25%	50%	75%	90%	Std. Dev.
Analyst Forecast Errors (*AFE*)	0.019**	−0.004	−0.001	0.003**	0.017	0.048	0.064
Management Forecast Errors (*FE*)	0.017**	−0.004	0.000	0.005**	0.021	0.041	0.054
Forecast News (*FN*)	−0.002*	−0.018	−0.004	0.000	0.003	0.023	0.027
Event Return ($CAR_{0,+1}$)	−0.031**	−0.158	−0.063	−0.009**	0.023	0.071	0.112
Market Value of Equity ($MM)	8,158	169	466	1,263	4,090	15,168	23,951
Beta	0.91	0.32	0.54	0.81	1.14	1.59	0.58
Market-to-Book Ratio	5.31	1.16	1.88	3.25	5.94	12.71	12.27
Calendar days between management forecast and fiscal year-end (*Horizon*)	237.45	58.00	113	245	332	421	141.09
Litigation	0.008	0.002	0.003	0.005	0.009	0.016	0.012
Distress	0.019	0.001	0.002	0.007	0.017	0.042	0.043
Industry Concentration (*Concen*)	0.244	0.069	0.107	0.195	0.317	0.497	0.186

---

*, ** Significant at .05 level and .01 level, respectively, using a two-tailed test based on the Student's t test for means and the Wilcoxon signed ranked test for medians.

Descriptive statistics for the sample of 925 management earnings forecasts released in the years 1996 through 2000. All variables are defined in Appendix A.

TABLE 4
Correlation Matrices

Panel A: Correlations between *FN*, *FE*, and *AFE*

	FN	*FE*	*AFE*
FN	1	−0.144**	−0.546**
FE	0.162**	1	0.908**
AFE	−0.602**	0.548**	1

Panel B: Correlations between Independent Variables Used to Test Management Bias Hypothesis (Hypothesis 1)

	Difficulty	*Litigation*	*Inside_ Trade*	*Distress*	*Concen*	*FN*	*Horizon*	$CAR_{-120,-1}$	*Size*	*M/B*	*DAccruals*
Difficulty	1	0.040	0.156**	0.168**	−0.015	−0.434**	0.060	−0.330**	−0.435**	−0.359**	−0.053
Litigation	−0.173**	1	−0.049	0.021	0.004	−0.020	0.079*	−0.139**	0.302**	0.210**	−0.009
Inside_ Trade	0.172**	−0.037	1	0.055	0.047	−0.131**	0.043	−0.200**	−0.134**	−0.122**	0.020
Distress	0.124**	−0.211**	0.111**	1	0.002	−0.088**	0.009	−0.072*	−0.134**	−0.102**	−0.042
Concen	0.024	0.006	0.050	0.072*	1	−0.031	0.012	−0.047	0.047	−0.023	−0.045
FN	−0.442**	0.031	−0.194**	−0.216**	−0.073*	1	0.021	0.336**	0.216**	0.291**	−0.004
Horizon	0.057	0.149**	0.036	−0.047	0.014	0.123**	1	−0.023	0.155**	0.096**	−0.011
$CAR_{-120,-1}$	−0.285**	−0.211**	−0.229**	−0.078*	−0.063	0.407**	−0.025	1	0.102**	0.308**	−0.035
Size	−0.517**	0.693**	−0.125**	−0.180**	−0.001	0.264**	0.169**	0.091**	1	0.488**	0.067*
M/B	−0.382**	0.370**	−0.123**	−0.237**	−0.071*	0.361**	0.091**	0.295**	0.458**	1	0.028
DAccruals	−0.029	0.016	0.002	−0.012	−0.078*	−0.020	0.002	−0.059	0.035	0.042	1

(*continued on next page*)

TABLE 4 (Continued)

Panel C: Correlations between Independent Variables Used to Test Market Response Hypothesis (Hypothesis 2)

	FN	FE_{fitted}	*Bad_ News*	*Predict_ Loss*	*Type*	*Horizon*	*DAccruals*	*M/B*	*Esurp*
FN	1	−0.207**	−0.467**	−0.173**	−0.161**	0.021	−0.004	0.291**	0.124**
FE_{fitted}	−0.021	1	0.085**	0.199**	0.088**	0.154**	−0.009	−0.131**	−0.294**
Bad_News	−0.866**	0.048	1	0.059	0.278**	−0.079*	0.033	−0.271**	−0.072*
Predict_ Loss	−0.108**	0.051	0.059	1	0.020	−0.122**	−0.026	−0.044	−0.079*
Type	−0.218**	0.134**	0.278**	0.020	1	−0.068*	−0.056	−0.121**	0.012
Horizon	0.123**	0.232**	−0.076*	−0.131**	−0.056	1	−0.011	0.096**	−0.007
DAccruals	−0.020	−0.022	0.017	−0.057	−0.038	0.002	1	0.028	0.023
M/B	0.361**	−0.117**	−0.272**	−0.041	−0.124**	0.091**	0.042	1	0.081*
Esurp	0.137**	−0.035	−0.138**	−0.039	−0.037	0.016	−0.019	0.076*	1

---

*, ** Significant at .05 and .01 levels, respectively, using a two-tailed test.

Correlation matrices for the sample of 925 management earnings forecasts released in the years 1996 through 2000. Spearman (Pearson) correlations are presented below (above) the diagonal. All variables are defined in Appendix A.

Forecast Error (*FE*): Forecast error, *FE*, is defined as:

$$FE = (Management\ forecast - Actual\ EPS) \div Pre\text{-}release\ share\ price.$$

Management forecast of EPS is either a point estimate or mid-point of a range estimate of the firm's annual earnings.[8] *Actual EPS* is the realized EPS reported by First Call. Using both forecasts and EPS reported by First Call ensures consistency between management and analyst forecasts, and also ensures actual and forecasted earnings are on the same basis. *Pre-release share price* is the closing price on CRSP one day prior to the management forecast release date.

Forecasting Difficulty (*Difficulty*): Market participants' ability to assess the credibility of a manager's forecast is positively associated with the manager's ability to forecast accurately. While no single variable perfectly captures the difficulty of forecasting earnings accurately, we believe several variables measure this construct, albeit with error. We use factor analysis to identify this construct. We assume the variance of each indicator variable is composed of two components: variance associated with the latent construct, and variance specific to that indicator. Further, we assume the indicator specific variances are uncorrelated across variables. Consistent with the goal of predicting forecast errors, all variables are measured prior to the release of a forecast.

The following indicator variables generate a measure of forecasting difficulty: First, when earnings are difficult to predict, we expect analysts to disagree about the forthcoming earnings. The standard deviation of analyst forecasts outstanding when the management forecast is released, *STD_AF*, measures lack of analyst consensus. Second, if the difficulty analysts experience forecasting earnings is correlated through time, then the variability of previous analyst forecast errors is positively associated with the current difficulty of forecasting earnings. The standard deviation of previous analyst forecast errors scaled by price for five years prior to the forecast release, *STD_AFE*, proxies for the difficulty analysts experienced when predicting earnings. Third, it is more difficult to forecast a firm's earnings when the firm is unprofitable than when it is profitable.[9] To recognize this asymmetry, the indicator *Lagged_Loss* equals 1 when a firm's quarterly earnings report preceding the forecast is negative, and 0 otherwise. Also the indicator *Predict_Loss* equals 1 when the management forecast of earnings is negative, and 0 otherwise. Fourth, it may be more difficult to forecast a firm's earnings when its "true" earnings are more volatile. We regard "true" earnings as those that would be reported in the absence of the strategic manipulation or smoothing of earnings. Volatility in the firm's "true" earnings is positively associated with volatility in a firm's stock price, measured as the standard deviation of daily stock price for 120 days before the forecast date and denoted *STD_RET*. In addition, a firm's bid-ask spread is associated with a market specialist's perception of information asymmetry in the market, which is expected to increase with uncertainty about the firm's forthcoming earnings announcement (see Coller and Yohn 1997). We use the TAQ database to measure the average relative bid-ask spread for a 20-trading-day period ending two days before the forecast date, denoted *Spread*. Specifically, we calculate the average of all quoted relative spreads for each day and then average over the 20 trading days; filters were used to reduce the effect of reporting errors. Last, Baginski et al. (1993) argue that managers reveal their uncertainty about earnings by issuing forecasts with wider ranges. We use the width of range estimates, denoted *MF_Width*, to proxy for manager revealed uncertainty; for point estimates, we set *MF_Width* equal to zero.

---

[8] Prior research suggests that investors use the mid-point of a range forecast when forming their expectation of earnings (e.g., Baginski et al. 1993; Hirst et al. 1999).

[9] Brown (2001) finds the distributions of earnings surprises (i.e., differences between actual earnings and analyst earnings forecasts) differ between firms reporting profits and those reporting losses. He finds firms reporting profits are more likely to meet or exceed analyst earnings estimates than firms reporting losses. Accordingly, it might be argued that we should control for the current year earnings realization. Because managers and investors are uncertain whether a firm will report a profit or loss when the management forecast is released, we are unable to develop a forecast error prediction model that incorporates the current year earnings realization.

Table 5 reports results of the factor analysis when the continuous indicators of forecast difficulty are winsorized at the 1 and 99 percent levels. Panel A shows the Pearson and Spearman correlations among the indicators. All of the significant correlations among the indicators have their expected sign except for that between *Predict_Loss* and *MF_Width*.[10]

We estimate the *Difficulty* latent variable using Principal Axis Factoring (PAF). Standard factor analysis heuristics (e.g., scree plots and eigenvalues) suggest two factors. After considering the sign and magnitude of the factor loadings (not tabulated), we extract the first factor as a measure of forecast difficulty. Since we reject normality (not tabulated) for each of the indicator variables, we also estimate the factor using the asymptotic distribution-free estimation method (ADF) developed by Browne (1984).[11] In light of the distributional properties of ADF estimation, we use the ADF factor in the remainder of the paper.[12] The ADF factor pattern and the standardized scoring coefficients are presented in Panel B.[13] Alternatively, we use the indicator *STD_AF* as our sole proxy for forecast difficulty. Our hypothesized results remain qualitatively similar except we reject the null hypothesis in H1d (effect of the competitive environment) only at the 10 percent level.

Litigation (*Litigation*): To proxy for the incentives created by the litigation environment, we estimate the lagged probability of litigation using a probit specification where we regress the incidence of a lawsuit onto firm-specific measures and high-litigation industry membership; see Appendix B for further details. *Litigation* is defined as the previous quarter's probability of litigation obtained from this model. H1a predicts that managers of firms more likely to face litigation issue less optimistic or more pessimistic forecasts than managers less likely to face litigation, and this incentive is dampened when it is more difficult for investors to detect manager misrepresentation. Accordingly, we expect the coefficient on *Litigation* to be negative and the coefficient on *Litigation* × *Difficulty* to be positive.

Insider transactions (*Inside_Trade*): We obtain insider transactions from Thomson Financial. We define an insider as a person who serves as an officer or director. Insider trading activity is measured over the ten-trading-day window beginning the day of the forecast, and it includes all transactions in the firm's shares (SEC Form 4, Table 1) or options (SEC Form 4, Table 2). Formally:

$$Inside\_Trade = \sum\nolimits_{Days} \sum\nolimits_{Insider} (acquisitions - disposals).$$

Since the volume of insider trading is characterized by large acquisitions and disposals, we use the ranked value of this variable.[14] Hypothesis 1b predicts that when it is more difficult

---

[10] All managers who predicted negative earnings issued a point rather than a range forecast.

[11] Lanen and Larcker (1992) discuss the appropriateness of using ADF estimation methods when indicators are not normally distributed.

[12] The ADF factor is highly correlated with the factor based on PAF analysis (Pearson 0.90, Spearman 0.98).

[13] Given the negative loading on *Predict_Loss* in Panel B of Table 5, we drop this indicator variable and repeat the factor analysis. Standard heuristics now suggest a single factor. Using this factor, which has positive loadings on all indicator variables, does not qualitatively affect our results.

[14] Our results are unaffected if we measure insider trading activity as [(*acquisitions* − *disposals*) × *Pre-release share price*] rather than volume. In addition, our results are robust to measuring insider trading for the chief executive only.

TABLE 5
Correlation Matrices and Factor Loadings for Forecast Difficulty Measure

Panel A: Correlation Matrix for Forecast Difficulty Indicators

	STD_AF	*STD_AFE*	*Lagged_Loss*	*Predict_Loss*	*STD_RET*	*Spread*	*MF_Width*
STD_AF	1	0.232**	0.239**	0.221**	0.208**	0.149**	0.241**
STD_AFE	0.423**	1	0.088**	0.116**	0.074*	0.088**	0.198**
Lagged_Loss	0.111**	0.162**	1	0.323**	0.170**	0.048	0.033
Predict_Loss	0.127**	0.129**	0.323**	1	0.152**	0.068*	−0.067*
STD_RET	0.200**	0.037	0.135**	0.141**	1	0.088**	0.115**
Spread	0.372**	0.244**	0.117**	0.095**	0.214**	1	0.114**
MF_Width	0.213**	0.100**	−0.010	−0.104**	0.026	0.134**	1

Panel B: Forecast Difficulty Factor Loadings (Asymptotic Distribution-Free Estimation)

Indicator	*STD_AF*	*STD_AFE*	*Lagged_Loss*	*Predict_Loss*	*STD_RET*	*Spread*	*MF_Width*
Factor Loading	0.429	0.136	0.087	−0.011	0.158	0.081	0.335
Standardized Factor Score	0.620	0.291	0.196	−0.026	0.330	0.184	0.549

*, ** Significant at .05 and .01 levels, respectively, using a two-tailed test.
Correlation matrices (Panel A) and factor loadings (Panel B) for the indicator variables used to construct the difficulty measure for the sample of 925 management forecasts released in the years 1996 through 2000. Spearman (Pearson) correlations are presented below (above) the diagonal. All variables are defined in Appendix A.

for investors to detect misrepresentation, insider disposals are associated with optimistic forecasts and insider acquisitions are associated with pessimistic forecasts. Therefore, we expect the coefficient on *Inside_Trade* × *Difficulty* to be negative.[15]

Distress (*Distress*): We expect a firm's financial health to affect its manager's forecasting incentives when the firm is in relatively poor financial health. We proxy for financial distress using Ohlson's (1980) bankruptcy prediction model one. *Distress* is assigned a value of 1 for forecasting firms in the most distressed decile, and 0 otherwise. Because H1c predicts that managers of financially distressed firms will issue optimistic forecasts when it is more difficult for the market to detect manager misrepresentation, we expect the coefficient on *Distress* × *Difficulty* to be positive.

Concentration (*Concen*): Industry concentration, *Concen*, is measured using the Herfindahl index, which equals the sum of the squares of the market shares of the firms within an industry. We define an industry as all firms reported on Compustat sharing the same four-digit SIC code. Hypothesis 1d posits that managers of firms in concentrated industries will issue pessimistic forecasts when it is more difficult to detect manager misrepresentation. Consequently, we predict the coefficient on $Concen \times Difficulty$ to be negative.

---

[15] Because we focus on interaction effects, we do not predict main effects for forecast difficulty, insider trading, financial distress, or concentration.

Control Variables: In addition to incentives that are publicly observable, managers also face incentives to misrepresent their information that are not directly observable but are implicitly revealed through their forecasting behavior; for instance, a manager's performance contract, which often is not publicly observable, may induce biased forecasting. McNichols (1989) argues that management incentives to bias their forecasts may cause forecast news and forecast errors to be positively correlated. We use forecast news to control for managements' implicitly revealed incentives to misrepresent their information. Forecast news, *FN*, is defined as:

$$FN = (\textit{Management forecast} - \textit{Consensus analyst forecast}) \div \textit{Pre-release share price.}$$

Management forecasts above the current consensus (mean) analyst forecast (i.e., $FN \geq 0$) are said to convey *good news*, while those below the current consensus (mean) analyst forecast (i.e., $FN < 0$) are said to convey *bad news*. The indicator variable, *Bad_News*, equals 1 when the forecast conveys bad news, and 0 otherwise, and *Good_News* is defined similarly.

We include several additional control variables. First, forecast horizon is introduced because several studies find forecast errors decline as forecasts are issued closer to the fiscal year-end (Choi and Ziebart 2000; Johnson et al. 2001). *Horizon* equals the number of calendar days between the forecast release date and the firm's fiscal year-end. Second, McNichols (1989) finds future forecast errors are correlated with previous cumulative abnormal returns. We control for this effect by calculating the cumulative daily return less the size-decile-matched CRSP Value-Weighted Index over the period 120 days before to one day before the forecast date, denoted $CAR_{-120,-1}$. Third, several studies find forecast behavior is associated with firm size (Baginski and Hassell 1997; Bamber and Cheon 1998). The natural log of the firm's market capitalization one day prior to the forecast, denoted *Size*, is used to proxy for firm size. Fourth, Bamber and Cheon (1998) document that growth opportunities affect a firm's forecasting behavior. They use a firm's market value to book value of equity ratio, M/B, as a measure of a firm's growth opportunities. M/B is calculated as the ratio of the firm's market capitalization one day prior to the forecast divided by the previous year's book value of equity. Fifth, earnings management can affect forecast errors because managers can manipulate reported earnings (McNichols 1989; Kasznik 1999). Kasznik (1999) finds evidence consistent with managers issuing an earnings forecast and then manipulating earnings to fall in line with the forecast. Therefore, the firm's ability to manipulate earnings as reflected by its discretionary accruals is included as a control. We use a version of the cross-sectional modified Jones model (see Dechow et al. 1995) to estimate discretionary accruals, *DAccruals*. Like Kasznik (1999), we include change in operating cash flows as an additional explanatory variable and estimate the model for all firms within a particular year and two-digit SIC code.[16] Last, we include fixed effects for industry and year. We define an industry as all firms reported on Compustat sharing the same four-digit SIC code.

---

[16] There are limitations associated with using discretionary accrual models to detect earnings management; see Dechow et al. (1995) and Kothari (2001).

Results for Hypothesis 1

Table 6 reports the results for the regression analysis of the management forecast errors. We find strong evidence of the predictability of management forecast errors as indicated by the adjusted R^2 of about 30 percent.

First, the coefficient on *Litigation* is significantly negative and the coefficient on *Litigation* × *Difficulty* is significantly positive. To assess the effect of influential observations, we exclude observations with Studentized residuals greater than 2. We find the coefficient on *Litigation* is no longer significant although the coefficient on *Litigation* × *Difficulty*

TABLE 6
Results for the Management Forecast Bias Hypothesis (Hypothesis 1)

Regression results for the sample of 925 forecasts released in the years 1996 through 2000. The coefficients and related t-statistics are estimated using the following model:

$$\begin{aligned} \mathit{FE} = {} & \beta_1 \mathit{Difficulty} + \beta_2 \mathit{Litigation} + \beta_3 \mathit{Litigation} \times \mathit{Difficulty} + \beta_4 \mathit{Inside\_Trade} \\ & + \beta_5 \mathit{Inside\_Trade} \times \mathit{Difficulty} + \beta_6 \mathit{Distress} + \beta_7 \mathit{Distress} \times \mathit{Difficulty} + \beta_8 \mathit{Concen} \\ & + \beta_9 \mathit{Concen} \times \mathit{Difficulty} + \beta_{10} \mathit{Bad\_News} + \beta_{11} \mathit{FN} \times \mathit{Good\_News} + \beta_{12} \mathit{FN} \times \mathit{Bad\_News} \\ & + \beta_{13} \mathit{Horizon} + \beta_{14} \mathit{CAR}_{-120,-1} + \beta_{15} \mathit{Size} + \beta_{16} \mathit{M/B} + \beta_{17} \mathit{DAccruals} + \varepsilon. \end{aligned}$$

Dependent Variable: Management Forecast Errors (*FE*)

Variable	Predicted Sign	Coefficient	t-stat
Difficulty	none	0.020	4.38**
Litigation	–	−0.490	−2.02*
Litigation × *Difficulty*	+	0.416	4.07**
Inside_Trade[#]	none	−0.018	−2.58**
Inside_Trade × *Difficulty*[#]	–	−0.025	−4.50**
Distress	none	−0.009	−1.28
Distress × *Difficulty*	+	0.024	6.20**
Concen	none	0.024	0.48
Concen × *Difficulty*	–	−0.021	−2.12*
Bad_News	none	0.001	0.17
FN × *Good_News*	+	0.717	3.69**
FN × *Bad_News*	+	−0.419	−3.94**
Horizon[#]	+	0.027	2.12*
$\mathit{CAR}_{-120,-1}$	–	−0.025	−3.56**
Size[#]	none	1.717	1.05
M/B[#]	none	−0.693	−0.77
DAccruals[#]	none	0.306	0.38
Industry and Year Fixed Effects		Yes	
Adjusted R^2		29.96%	
F		3.12**	
n		925	

---

*, ** Significant at .05 and .01 levels, respectively, based on one-tailed tests for signed predictions, two-tailed tests otherwise.

[#] Coefficients have been multiplied by 10^3 for expositional purposes.

All variables are defined in Appendix A.

continues to be significantly positive. Because we only find weak evidence that managers who are more likely to face litigation issue less optimistic forecasts, we do not reject the null hypothesis in H1a. Nevertheless, we note managers' incentives to misrepresent information caused by the threat of litigation are affected by the difficulty the market experiences assessing forecast credibility.

Our inability to find robust litigation results might be due to the power of our setting: a long window between the forecast release and earnings announcement dates might not provide a powerful test for whether the threat of litigation induces pessimism. Firms in a litigious environment want to prevent a large disappointment on the earnings announcement date (see Soffer et al. 2000). This goal might be better accomplished by providing a less optimistic or even pessimistic forecast shortly before the earnings release date.

Second, the coefficient on *Inside_Trade* × *Difficulty* is significantly negative and robust to removing influential observations; therefore, we reject the null hypothesis in H1b. This result is consistent with managers strategically manipulating their forecasts in a self-interested fashion when it is more difficult for the market to assess the truthfulness of their disclosure. Although we do not predict a main effect for insider transactions, we find a significant negative relation between insider transactions and forecast errors. Hence, managers appear to bias their forecasts to profitably exploit the stock mispricing these forecasts might induce.

This finding seems inconsistent with Noe (1999) who observes an insignificant relation between insider transactions and forecast errors. Noe (1999) studies open market transactions. To reconcile our results with those of Noe (1999), we repeat our analysis restricting attention to open market stock transactions. In this test, which is not tabulated, we find that the coefficient on *Inside_Trade* is insignificant while the coefficient on *Inside_Trade* × *Difficulty* remains significantly negative. Therefore, managers appear more likely to bias their disclosure in anticipation of engaging in open market stock transactions *only* when it is more difficult for the market to assess the truthfulness of their disclosure.[17] These results suggest the coefficient on *Inside_Trade* is driven by the exercise or granting of stock options. Since option exercises are associated with stock acquisitions, these effects should be offsetting in our measure of insider trading activities. Thus, our results are likely driven by option grants. We measure option grants using an indicator variable that equals 1 if options are granted, and 0 otherwise. We find that managers opportunistically depress their forecasts before option grants, and they are more likely to do so when it is more difficult for the market to detect this opportunism. This observation complements Aboody and Kasznik (2000) who find managers time their voluntary disclosure around scheduled option grant dates to maximize the value of stock option awards.

Third, the coefficient on *Distress* × *Difficulty* is significantly positive and robust to removing influential observations, which allows us to reject the null hypothesis in H1c. Thus, managers of financially distressed firms issue optimistic forecasts when it is more difficult for the market to detect dissembling. Interestingly, the coefficient on *Distress* is insignificant suggesting that when evaluating the effect of managers' incentives on their forecasting behavior, it is important to consider investors' ability to assess forecast credibility.

Fourth, the coefficient on *Concen* × *Difficulty* is significantly negative and robust to removing influential observations. In rejecting the null hypothesis in H1d, we show the market's ability to assess forecast credibility affects the relation between concentration and forecast bias.

---

[17] When we exclude *Inside_Trade* × *Difficulty* from the analysis of open market transactions, the coefficient on *Inside_Trade* remains insignificant.

Regarding the control variables, the association between good news forecasts and forecast errors is significantly positive. In contrast to our prediction, the association between bad news forecasts and forecast errors is significantly negative. This relation suggests managers are systematically optimistic. The significant coefficients on the remaining control variables have the expected sign.

It is common for firms to have unusual items that affect their operating performance. First Call Corporation (1999, 9) adjusts actual EPS "to exclude any unusual items that a majority of the contributing analysts deem non-operating and/or non-recurring." This adjustment helps ensure that analyst forecasts and actual earnings are reported on a consistent basis (Gu and Chen 2003). Because managers and analysts might not treat unusual items consistently, we restrict attention to the sample of 313 observations that do not have the following items on Compustat: discontinued operations, extraordinary items, accounting changes, impairments of goodwill, restructuring costs, write-downs, and other special items. For this reduced sample, we continue to find the hypothesized relations for insider trading and distress.[18]

Research Design for Hypothesis 2

To examine the stock price response to management forecasts, we estimate the following model using cross-sectional OLS regression (firm and time subscripts have been suppressed):

$$CAR_{0,+1} = \gamma_0 + \gamma_1 FN + \gamma_2 FN \times FE_{fitted} \times Good\_News + \gamma_3 FN \times FE_{fitted} \times Bad\_News + Control\ variables + \varepsilon. \qquad (2)$$

The model's variables are defined as follows:

Event Return ($CAR_{0,+1}$): The market response to the forecast release, or event return, is the cumulative daily return less the size-decile-matched CRSP Value-Weighted Index return over the window that includes the day of the forecast release to one day after the release. When the forecast is released after the close of trading (244 observations), we adjust the forecast date to the next trading day.

Predicted Forecast Error (FE_{fitted}): Consistent with a rational expectations equilibrium where managers bias their forecasts and investors anticipate this behavior given their conjecture of the managers' forecasting strategies (Stein 1989; Fischer and Verrecchia 2000), we hypothesize that the market response to a management forecast is a function of the predicted bias in the forecast. To proxy for forecast bias, we use the fitted, or predicted, forecast error, FE_{fitted}, from Equation (1).[19] In operationalizing our hypotheses, we allow the response coefficient to vary with the predicted forecast error and with whether the forecast contains good or bad news.[20] Based on H2, we predict the coefficient on $FN \times FE_{fitted} \times Good\_News$ to be negative and that on $FN \times FE_{fitted} \times Bad\_News$ to be positive. In contrast, if the market does not filter the predicted forecast bias when responding to the forecast or if predicted forecast error, FE_{fitted}, is an inappropriate proxy for the market's expectation of forecast bias, then the coefficients on $FN \times FE_{fitted} \times Good\_News$ and $FN \times FE_{fitted} \times Bad\_News$ should be zero.[21]

---

[18] It might be argued that firms that suffer losses, and hence have higher forecasts errors, are more likely to have unusual items, which make forecasting more difficult. We include information about expected losses (i.e., *Lagged_Loss* and *Predict_Loss*) in our difficulty measure to capture the notion that negative earnings are more difficult to forecast. However, because losses may be correlated with the presence of unusual items, which may have been unforeseen when forecasting, the correlation between *Difficulty* and realized losses could cause spurious results. Consequently, we examine the correlation between whether a firm reported unusual items and *Difficulty* as First Call might not have fully adjusted for these items. We do not find a significant correlation providing comfort that the difficulty measure is not correlated with unusual items that could affect the distribution of forecast errors.

[19] Because the *Inside_Trade* variable uses data only observable after the forecast release date, we assess the effect of omitting the *Inside_Trade* variable. Omitting this variable does not qualitatively alter the results.

While our study of the market's response to management forecasts is reminiscent of McNichols (1989), there are key differences between the studies. Specifically, to investigate the information that investors impound in stock prices but managers do not reflect in their forecasts, McNichols regresses the stock price response onto forecast news and onto *actual* forecast errors. She finds a differential response to management forecasts with actual forecast errors that are *ex post* too high or too low indicating that, in aggregate, investors do not take forecasts at face value. She suggests this response might be attributable to either management forecasting bias or investors having access to information not available to management. Given her weak evidence of bias in management forecasts, she concludes the correlation between the stock price response and management forecast errors is more likely due to investors having better information. In contrast, our study, having established management bias their forecasts in predictable ways, examines the extent to which investors modify their response to a forecast when it is predictably biased. Therefore, we regress stock price response onto forecast news and onto forecast news interacted with the predicted forecast error, and we consider how the response coefficient varies with predictable forecast bias.

Control Variables: We use several variables identified in previous studies to control for cross-sectional differences in response coefficients. First, a number of studies document a nonlinear relation between stock returns and earnings (Freeman and Tse 1992). Consistent with Lipe et al. (1998), $FN \times |FN|$ controls for potential nonlinearities in the market's response. Second, prior research finds the market is less responsive to reports of negative earnings (Hayn 1995; Basu 1997). Consequently, we allow the response coefficient to vary depending on whether the manager forecasts positive or negative earnings by introducing the variable $FN \times Predict\_Loss$. Third, prior research notes the stock price response varies according to forecast specificity (Baginski et al. 1993). Therefore, we introduce $FN \times Type$, where *Type* equals 1 if the manager offers a range estimate, and 0 otherwise. Fourth, the market response to the forecast may vary according to the forecast horizon; therefore, we include $FN \times Horizon$. Fifth, a manager can issue a biased forecast and then hide the bias by manipulating reported earnings (Kasznik 1999). To control for the effect of earnings management on forecast credibility, the response coefficient is allowed to vary with the lagged value of discretionary accruals, $FN \times DAccruals$. Sixth, the response coefficient is allowed to vary with the firm's market-to-book ratio, $FN \times M/B$. Last, to control for the information in earnings that are released contemporaneously with forecasts, we introduce additional earnings announcement related control variables. We control for earnings surprise, defined as:

---

[20] Previous studies examining firms' voluntary disclosure find good and bad news induce different market responses (e.g., Jennings 1987; Skinner 1994; Kasznik and Lev 1995).

[21] Using actual rather than predicted forecast errors does not qualitatively affect our results. Such a specification, however, is inconsistent with our emphasis on the market attempting to predict management forecasting bias and filtering it from management earnings forecasts.

$$Esurp = (Actual\ EPS - Consensus\ analyst\ forecast) / Pre\text{-}release\ share\ price$$

when a firm announces earnings contemporaneously with releasing a forecast; when an earnings announcement is not released contemporaneously, *Esurp* equals 0. Further, the variables discussed above to control for cross-sectional differences in the forecast response coefficient are also used to control for cross-sectional differences in the earnings response coefficient. We control for *Esurp* × |*Esurp*|, *Esurp* × |*Dum_NegE*| where *Dum_NegE* equals 1 if actual earnings are negative, and 0 otherwise, *Esurp* × *DAccruals*, and *Esurp* × M/B.

Results for Hypothesis 2

Table 7 reports results from the pooled OLS analysis of the market response to management earnings forecasts and predicted forecast errors. The adjusted R^2 of about 12 percent indicates our model explains a substantial portion of the variation in returns. Consistent with prior studies (e.g., Ajinkya and Gift 1984; Waymire 1984), the market response is positively associated with the forecast news, *FN*. For good news forecasts, the market responds less positively to forecasts with higher predicted optimism and more positively to forecasts with higher predicted pessimism; i.e., the coefficient on $FN \times FE_{fitted} \times Good\_News$ is significantly negative and is robust to the effect of removing influential observations. For bad news forecasts, we find an analogous relation; i.e., the coefficient on $FN \times FE_{fitted} \times Bad\_News$ is significantly positive. When we remove observations with Studentized residuals greater than 2, this coefficient is not significantly different from 0. Regarding the control variables, the significant coefficients have the expected sign. For the 167 observations that had earnings announcements in the event window, the coefficient on the earnings surprise is positive and significant. Further, the market is significantly less responsive to reports of negative earnings.

We find the market filters out the predictable bias in good news forecasts. In contrast, it only seems to filter out the predictable bias in bad news forecasts for extreme observations. Consequently, the market typically behaves as if good news forecasts are less credible than bad news forecasts.

Our finding that good news is less credible than bad news is consistent with several studies. Jennings (1987) uses analyst forecast revisions subsequent to the forecast release to proxy for forecast credibility. He finds a significant difference in the market response to good news forecasts that are confirmed relative to those not confirmed by analyst forecast revisions; in contrast, he finds no difference in the market response to bad news forecasts that are confirmed versus those that are not confirmed. He therefore argues bad news is more credible than good news. In a similar spirit, Williams (1996) uses an empirical measure of prior forecast usefulness to capture the "believability" of forecasts. She finds analysts consider prior forecast usefulness when responding to good but not to bad news forecasts. Hence, she contends good news forecasts are less credible than bad news forecasts. Hutton et al. (2003) also argue bad news forecasts are inherently more believable than good news forecasts.

Although the market views good news forecasts as being less credible than bad news forecasts, we do not find evidence that bad news is unbiased or even less biased than good news. In fact, mean predicted forecast errors and mean actual forecast errors are *lower* for good news than bad news forecasts, although these differences are only significant for the

TABLE 7
Event Return Results for the Market Response Hypothesis (Hypothesis 2)

Event return regression results for the sample of 925 forecasts released in the years 1996 through 2000. The coefficients and related t-statistics are estimated using the following model:

$$\begin{aligned} CAR_{0,+1} = {} & \gamma_0 + \gamma_1 FN + \gamma_2 FN \times FE_{fitted} \times Good\_News + \gamma_3 FN \times FE_{fitted} \times Bad\_News \\ & + \gamma_4 FN \times |FN| + \gamma_5 FN \times Predict\_Loss + \gamma_6 FN \times Type + \gamma_7 FN \times Horizon \\ & + \gamma_8 FN \times DAccruals + \gamma_9 FN \times M/B + \gamma_{10} Esurp + \gamma_{11} Esurp \times |Esurp| \\ & + \gamma_{12} Esurp \times Dum\_NegE + \gamma_{13} Esurp \times DAccruals + \gamma_{14} Esurp \times M/B + \varepsilon. \end{aligned}$$

Dependent Variable: Event Period Return ($CAR_{0,+1}$)

Variable	Predicted Sign	Coefficient	t-stat#
Intercept	none	−0.029	−7.61**
FN	+	1.920	2.95**
$FN \times FE_{fitted} \times Good\_News$	−	−28.072	−2.17*
$FN \times FE_{fitted} \times Bad\_News$	+	5.782	2.16*
$FN \times \|FN\|$	−	−0.190	−3.53**
$FN \times Predict\_Loss$	−	−1.377	−2.23*
$FN \times Type$	−	−0.195	−0.42
$FN \times Horizon$	−	−0.003	−1.78*
$FN \times DAccruals$	none	0.057	0.70
$FN \times M/B$	+	0.273	2.46**
$Esurp$	+	8.117	3.65**
$Esurp \times \|Esurp\|$	−	−21.497	−2.21*
$Esurp \times Dum\_NegE$	−	−5.916	−2.74**
$Esurp \times DAccruals$	none	1.062	0.89
$Esurp \times M/B$	+	0.099	0.37
Adjusted R^2		11.59%	
F		11.38**	
n		925	

*, ** Significant at .05 and .01 levels, respectively, based on one-tailed tests for signed predictions, two-tailed tests otherwise.
#Heteroscedastic robust t-statistics are reported.
All variables are defined in Appendix A.

mean predicted forecast errors (p-value of 0.01 and p-value of 0.08, respectively).[22] The response to bad news forecasts observed in Table 7 suggests the market does not immediately filter out predictable forecast errors (except for extreme observations).

To assess whether the market impounds predictable forecast errors into prices with some delay, we estimate the following model using a cross-sectional OLS regression (firm and time subscripts are suppressed):

---

[22] Moreover, the standard deviation of mean predicted errors and of actual forecast errors are significantly less for good news than bad news forecasts.

$$CAR_{+2,+6} = \delta_0 + \delta_1 FE_{fitted} \times Good\_News + \delta_2 FE_{fitted} \times Bad\_News + \delta_3 Size + \delta_4 M/B + \delta_5 P/E + \delta_6 Beta + \varepsilon. \quad (3)$$

The *post*-event excess return, $CAR_{+2,+6}$, is the cumulative daily return less the size-decile-matched CRSP Value-Weighted Index return for a five-trading-day window starting two trading days after the forecast release date.[23] We introduce firm size, market-to-book ratio, price-earnings ratio, and historical beta as control variables to ensure the predicted forecast errors in good and bad news forecasts are incremental to the effects already shown to predict future stock returns (Fama and French 1992). The price-to-earnings ratio, P/E, is measured as the market price per share one day before the forecast date divided by the lagged EPS reported by First Call. Due to measurement error and the presence of outliers, we use the decile-ranked values of P/E in our analysis. Historical beta, *Beta*, is measured as the slope coefficient from regressing firm-specific daily returns on the size-decile-matched CRSP Value-Weighted Index for 120 trading days prior to the forecast release. The other variables in Expression (3) were previously defined.

In untabulated results for the regression specified in Expression (3), we do not find an association between *post*-event excess returns and predicted forecast errors; i.e., the coefficients on $FE_{fitted} \times Good\_News$ and $FE_{fitted} \times Bad\_News$ are not significantly different from zero and are robust to the effect of removing influential observations. For good news forecasts, this finding, when combined with those reported in Table 7, is consistent with the market having promptly filtered out predictable forecast errors. These results allow us to reject the null hypothesis in H2. However, for bad news forecasts, these findings suggest the market typically does not filter out predictable forecast errors, even with some delay.

V. SUMMARY AND CONCLUSIONS

This paper hypothesizes that managers often have incentives to forecast in a self-interested fashion but are constrained by the possibility that deviant forecasting will be detected and punished. The market participants' ability to detect dissembling, in turn, is a function of how difficult it is to forecast earnings. Therefore, forecast bias is a function of both manager incentives and the difficulty the market experiences detecting manager misrepresentation.

With this relation in mind, we examine the association between forecast errors and manager incentives coupled with the difficulty of detecting manager misrepresentation. We find evidence consistent with the hypothesis that whether managers misrepresent their forward-looking information in response to their incentives varies with the market's ability to detect their misrepresentations.

We also investigate the stock market's response to the predicted errors in forecasts. For good news forecasts, we find the market responds less positively to forecasts with greater predicted optimism and more positively to forecasts with greater predicted pessimism. For bad news forecasts, we find weak evidence that the market varies its response to the predicted bias in these forecasts. Therefore, we conclude the market predicts and filters bias from management forecasts but the efficiency of the market's response varies with the forecast news.

APPENDIX A

Management Forecast Bias (H1) is tested using the following variables:

---

[23] All of our results are qualitatively similar if we measure post-event excess returns over a ten-trading-day window instead of a five-trading-day window.

AFE = analyst forecast error defined as the consensus (mean) analyst forecast issued prior to the corresponding management forecast minus actual earnings per share deflated by the pre-release share price;

FE = management forecast error defined as the management forecast less actual earnings deflated by the pre-release share price;

FN = forecast news defined as the management forecast minus the most recent consensus (mean) analyst forecast deflated by the pre-release share price;

Difficulty = forecasting difficulty measured as the factor score from the latent variable analysis;

Litigation = the probability of securities-related litigation lagged by one quarter estimated using a probit model; see Appendix B for variable definitions related to this model;

Inside_Trade =the ranked net volume of insider transactions by officers and directors in the firm's shares or options;

Distress = indicator variable equal to 1 when fitted value from Ohlson's (1980) bankruptcy prediction (model 1) is in the most distressed decile, and 0 otherwise;

Concen = industry concentration measured as the Herfindahl index calculated using revenues of all firms in the same four-digit SIC code;

Bad_News = bad news forecast measured as an indicator variable equal to 1 if forecast news (*FN*) is negative, and 0 otherwise;

Good_News = good news forecast measured as an indicator variable equal to 1 if forecast news (*FN*) is non-negative, and 0 otherwise;

Horizon = number of calendar days between the management forecast and the corresponding earnings announcement;

$CAR_{-120,-1}$ = cumulative return less the size-decile-matched CRSP Value-Weighted Index for the 120 days prior to the forecast release date;

Size = natural log of the pre-release market value of equity in dollars;

M/B = decile rank of the *Market-to-Book Ratio*, which is the pre-forecast release market value of equity divided by book value of equity at the prior year-end; and

DAccruals = value of discretionary accruals estimated using the cross-sectional modified Jones model deflated by the pre-release share price.

Difficulty Measure is developed using the following indicator variables:

STD_AF = standard deviation of analyst forecasts prior to the corresponding management forecast;

STD_AFE = standard deviation of previous analyst forecast errors (*AFE*) over the five years prior to the management forecast;

Lagged_Loss =an indicator variable equal to 1 when a firm's quarterly earnings report that precedes the forecast is negative, and 0 otherwise;

Predict_Loss =an indicator variable equal to 1 if the management forecast is negative, and 0 otherwise;

STD_RET = standard deviation of daily returns over the period 120 days before to one day before the forecast release date;

Spread = average bid-ask spread calculated using all quotes of the best ask minus the best bid divided by the quote midpoint for 20 trading days ending two days prior to the forecast release date; and

MF_Width = forecast width calculated as the top of the management forecast range less the bottom of the range deflated by pre-release share price for all range estimates; it equals 0 for point estimates.

Market Response (H2) is tested using the following variables in addition to some of the variables used in examining Management Forecast Bias:

$CAR_{0,+1}$ = event period return measured as the cumulative daily return less the size-decile-matched CRSP Value-Weighted Index from the day of to one day after the forecast release date;

$CAR_{+2,+6}$ = post-event return measured as the cumulative daily return less the size-decile-matched CRSP Value-Weighted Index for a five-trading-day window starting two trading days after the forecast release date;

FE_{fitted} = fitted forecast error from a regression of forecast errors (*FE*) on several variables measuring management incentives and forecasting difficulty;

Type = forecast type measured as an indicator variable equal to 1 if the manager issues a range forecast, and 0 otherwise;

Esurp = earnings surprise measured as actual earnings minus the most recent consensus analyst forecast deflated by share price for firms that issued an earnings announcement contemporaneously with the management forecast;

Dum_NegE = an indicator variable equal to 1 if the prior actual earnings are negative, and 0 otherwise;

P/E = price-earnings ratio measured as the decile rank of the pre-forecast market value of equity divided by prior year earnings; and

Beta = slope coefficient from regressing firm-specific daily returns on the size-decile-matched CRSP Value-Weighted Index for 120 trading days prior to the forecast release date.

APPENDIX B

The probability of litigation is estimated using the following probit model for each firm-quarter:

$$\begin{aligned} Pr\,(Lawsuit = 1) = G\,(&\alpha_0 + \alpha_1 Size + \alpha_2 Turn + \alpha_3 Beta + \alpha_4 Returns \\ &+ \alpha_5 Std\_Ret + \alpha_6 Skewness + \alpha_7 Min\_Ret \\ &+ \Sigma High\ Risk\ Industries + \varepsilon), \end{aligned} \tag{4}$$

where $G(\cdot)$ is the standard normal cumulative distribution function. The following variables are measured over a calendar quarter from the fourth quarter of 1995 to the fourth quarter of 2000. *Lawsuit* equals 1 if a securities class action lawsuit was recorded by Stanford Law School's *Securities Class Action Clearinghouse* during a calendar quarter, and 0 otherwise; we exclude lawsuits related to initial public offerings.[24] The following continuous regressors are measured over the calendar quarter. *Size* is the natural log of the average market value of equity measured in dollars. *Turn* is the average daily share volume divided by the average shares outstanding. *Beta* is the slope coefficient from regressing daily returns on the CRSP Equal-Weighted Index. *Returns* is defined as buy and hold returns. *Std_Ret* is the standard deviation of the daily returns. *Skewness* is defined as the skewness of the daily returns.

---

[24] Grundfest and Perino (1997b) find lawsuits are filed on average 79 days after the event that triggered the suit. Therefore, we adjust filing dates by 79 days when matching a lawsuit to a calendar quarter.

Min_Ret is the minimum of the daily returns. The high-risk industry indicators represent Bio-technology (SIC 2833 to 2836), Computer Hardware (SIC 3570 to 3577), Electronics (SIC 3600 to 3674), Retailing (SIC 5200 to 5961), and Computer Software (SIC 7371 to 7379).

This model was estimated using all firms on First Call with sufficient information on CRSP. The independent variables are similar to those used in prior studies to estimate litigation risk (e.g., Johnson et al. 2001; Francis et al. 1994). The estimated probit model is detailed in Table 8.

TABLE 8
Probit Results for Probability of Litigation

This table presents the model that estimates the probability of litigation. The sample period ranges from the fourth quarter of 1995 to the fourth quarter of 2000. The coefficients and related χ^2-statistics are estimated using the following probit model:

$$Prob\ (Lawsuit = 1) = G\ (\alpha_0 + \alpha_1 Size + \alpha_2 Turn + \alpha_3 Beta + \alpha_4 Returns + \alpha_5 Std\_Ret + \alpha_6 Skewness + \alpha_7 Min\_Ret + \Sigma\ High\ Risk\ Industries + \varepsilon).$$

Dependent Variable: Securities Class Action Lawsuit (*Lawsuit*)

Variable	Predicted Sign	Coefficient	χ^2
Intercept	none	−5.738	1424.52**
Size	+	0.141	384.35**
Turn	+	0.284	9.31**
Beta	+	0.012	5.68*
Returns	−	−0.237	29.36**
Std_Ret	+	−1.340	2.57
Skewness	−	0.011	0.46
Min_Ret	−	−3.161	137.40**
Bio-Technology	+	−0.025	0.13
Computer Hardware	+	0.378	39.20**
Electronics	+	0.075	1.78
Retailing	+	−0.034	0.28
Computer Software	+	0.211	22.45**
McFadden Psuedo R^2		12.26%	
n		150,812	

*, ** Significant at .05 and .01 levels, respectively, based on one-tailed tests for signed predictions, two-tailed tests otherwise.
All variables are defined in Appendix B.

REFERENCES

Aboody, D., and R. Kasznik. 2000. CEO stock option awards and the timing of corporate voluntary disclosures. *Journal of Accounting and Economics* 29 (3): 73–100.

Ajinkya, B. B., and M. J. Gift. 1984. Corporate managers' earnings forecasts and symmetrical adjustments of market expectations. *Journal of Accounting Research* 22 (2): 425–444.

Arshadi, N. 1998. Insider trading liability and enforcement strategy. *Financial Management* 27 (2): 70–84.

Baginski, S. P., E. J. Conrad, and J. M. Hassell. 1993. The effects of management forecast precision on equity pricing and on the assessment of earnings uncertainty. *The Accounting Review* 68 (4): 913–927.

———, and J. M. Hassell. 1997. Determinants of management forecast precision. *The Accounting Review* 72 (2): 303–312.

———, ———, and M. D. Kimbrough. 2002. The effect of legal environment on voluntary disclosure: Evidence from management earnings forecasts issued in U.S. and Canadian markets. *The Accounting Review* 77 (1): 25–50.

Bamber, L. S., and Y. S. Cheon. 1998. Discretionary management earnings forecast disclosures: Antecedents and outcomes associated with forecast venue and specificity choices. *Journal of Accounting Research* 36 (2): 167–190.

Basu, S. 1997. The conservatism principle and the asymmetric timeliness of earnings. *Journal of Accounting and Economics* 24 (1): 3–37.

Brown, L. D. 2001. A temporal analysis of earnings surprises: Profits versus losses. *Journal of Accounting Research* 39 (2): 221–241.

Browne, M. 1984. Asymptotically distribution-free methods for the analysis of covariance structures. *British Journal of Mathematical and Statistical Psychology* 37: 62–83.

Choi, J-H., and D. A. Ziebart. 2000. A reexamination of bias in management earnings forecasts. Working paper, Hong Kong University of Science and Technology and University of Illinois at Urbana–Champaign.

Coller, M., and T. L. Yohn. 1997. Management forecasts and information asymmetry: An examination of bid-ask spreads. *Journal of Accounting Research* 35 (2): 181–191.

Dechow, P. M., R. G. Sloan, and A. P. Sweeney. 1995. Detecting earnings management. *The Accounting Review* 70 (2): 193–225.

Fama, E., and K. French. 1992. The cross-section of expected stock returns. *Journal of Finance* 47 (2): 427–64.

First Call Corporation. 1999. *Historical Database (FCHD) User Guide.* Boston, MA: First Call Corporation.

Fischer, P. E., and R. E. Verrecchia. 2000. Reporting bias. *The Accounting Review* 75 (2): 229–245.

Francis, J., D. Philbrick, and K. Schipper. 1994. Shareholder litigation and corporate disclosures. *Journal of Accounting Research* 32 (2): 137–164.

Frankel, R., M. McNichols, and G. P. Wilson. 1995. Discretionary disclosure and external financing. *The Accounting Review* 70 (1): 135–150.

Freeman, R. B., and S. Y. Tse. 1992. A nonlinear model of security price responses to unexpected earnings. *Journal of Accounting Research* 30 (2): 185–209.

Frost, C. A. 1997. Disclosure policy choices of U.K. firms receiving modified audit reports. *Journal of Accounting and Economics* 23 (2): 163–187.

Grundfest, J. A., and M. A. Perino. 1997a. Securities litigation reform: The first year's experience. Working paper No. 140, Stanford Law School.

———, and ———. 1997b. Ten things we know and ten things we don't know about the Private Securities Litigation Reform Act of 1995. Joint Written Testimony before the Subcommittee on Securities of the Committee on Banking, Housing, and Urban Affairs, United States Senate, on July 24, 1997. Washington, D.C.: Government Printing Office.

Gu, Z., and T. Chen. 2004. Analysts' treatment of non-recurring items in street earnings. *Journal of Accounting and Economics* 38 (1-3): 129–171.

Hassell, J. M., and R. H. Jennings. 1986. Relative forecast accuracy and the timing of earnings forecast announcements. *The Accounting Review* 59 (1): 58–75.

Hayn, C. 1995. The information content of losses. *Journal of Accounting and Economics* 20 (2): 125–153.

Heflin, F., K. R. Subramanyam, and Y. Zhang. 2003. Regulation FD and the financial information environment: Early evidence. *The Accounting Review* 78 (1): 1–37.

Hirst, D. E., L. Koonce, and J. Miller. 1999. The joint effect of management's prior forecast accuracy and the form of its financial forecasts on investor judgment. *Journal of Accounting Research* 37 (Supplement): 101–124.

Hutton, A. P., G. S. Miller, and D. J. Skinner. 2003. The role of supplementary statements with management earnings forecasts. *Journal of Accounting Research* 41 (5): 867–890.

Jennings, R. 1987. Unsystematic security price movements, management earnings forecasts, and revisions in consensus analyst earnings forecasts. *Journal of Accounting Research* 25 (1): 90–110.

Johnson, M., R. Kasznik, and K. Nelson. 2001. The impact of securities litigation reform on the disclosure of forward-looking information by high technology firms. *Journal of Accounting Research* 39 (2): 297–327.

Kasznik, R., and B. Lev. 1995. To warn or not to warn: Management disclosure in the face of an earnings surprise. *The Accounting Review* 70 (1): 113–34.

———. 1999. On the association between voluntary disclosure and earnings management. *Journal of Accounting Research* 37 (1): 57–81.

Koch, A. S. 2002. Financial distress and the credibility of management earnings forecasts. GSIA Working paper No. 2000-10. Pittsburgh, PA: Carnegie Mellon University.

Kothari, S. P. 2001. Capital market research in accounting. *Journal of Accounting and Economics* 31 (1–3): 105–231.

Lanen, W. N., and D. F. Larcker. 1992. Executive compensation contract adoption in the electric utility industry. *Journal of Accounting Research* 30 (1): 70–93.

Lev, B., and S. H. Penman. 1990. Voluntary forecast disclosure, nondisclosure, and stock prices. *Journal of Accounting Research* 28 (1): 49–76.

Lipe, R. C., L. Bryant, and S. Widener. 1998. Do nonlinearity, firm-specific coefficients, and losses represent distinct factors in the relation between stock returns and accounting earnings? *Journal of Accounting and Economics* 25 (2): 195–214.

McNichols, M. 1989. Evidence of information asymmetries from management earnings forecasts and stock returns. *The Accounting Review* 64 (1): 1–27.

Newman, P., and R. Sansing. 1993. Disclosure policies with multiple users. *Journal of Accounting Research* 31 (1): 92–112.

Noe, C. F. 1999. Voluntary disclosure and insider transactions. *Journal of Accounting and Economics* 27 (3): 305–326.

Ohlson, J. A. 1980. Financial ratios and the probabilistic prediction of bankruptcy. *Journal of Accounting Research* 18 (1): 109–131.

Penman, S. H. 1980. An empirical investigation of the voluntary disclosure of corporate earnings forecasts. *Journal of Accounting Research* 18 (1): 132–160.

Pownall, G., and G. Waymire. 1989. Voluntary disclosure credibility and securities prices: Evidence from management earnings forecasts, 1969–73. *Journal of Accounting Research* 27 (2): 227–245.

———, C. Wasley, and G. Waymire. 1993. The stock price effects of alternative types of management earnings forecasts. *The Accounting Review* 68 (4): 896–912.

Sansing, R. C. 1992. Accounting and the credibility of management forecasts. *Contemporary Accounting Research* 9 (1): 33–45.

Skinner, D. J. 1994. Why firms voluntarily disclose bad news. *Journal of Accounting Research* 32 (1): 38–60.

Soffer, L. C., S. R. Thiagarajan, B. R. Walther. 2000. Earnings preannouncement strategies. *Review of Accounting Studies* 5 (1): 5–26.

Stein, J. C. 1989. Efficient capital markets, inefficient firms: A model of myopic corporate behavior. *The Quarterly Journal of Economics* 104 (4): 655–669.

Stocken, P. C. 2000. Credibility of voluntary disclosure. *The RAND Journal of Economics* 31 (2): 359–374.

Tirole, J. 1993. *The Theory of Industrial Organization*. Cambridge, MA: MIT Press.

Waymire, G. 1984. Additional evidence on the information content of management earnings forecasts. *Journal of Accounting Research* 22 (2): 703–718.

Williams, P. A. 1996. The relation between a prior earnings forecast by management and analyst response to a current management forecast. *The Accounting Review* 71 (1): 103–113.

Editorial Data

The following table contains information about turnaround time for manuscripts (including revisions) on which editorial decisions were made in the twelve-month period ended May 31, 2005. Turnaround time is the number of days between the date that the manuscript was received *and the date of the editor's letter to the author(s)*:

	Number of Manuscripts	Percent	Cumulative Number	Cumulative Percent
0 ≤ Days ≤ 30	95	20.08	95	20.08
31 ≤ Days ≤ 60	181	38.27	276	58.35
61 ≤ Days ≤ 90	145	30.66	421	89.01
91 ≤ Days ≤ 120	44	9.30	465	98.31
121 ≤ Days	8	1.69	473	100.00
Total	473	100.00		

The mean review time was 54.53; the median review time was 55 days.

New Submissions by calendar year (January 1 to December 31)

1992	241
1993	234
1994	231
1995	195
1996	230
1997	195
1998	196
1999	239
2000	260
2001	260*
2002	324
2003	327
2004	307
2005 (May 31)	171** (5 months)

* 2001—in addition to the 260 regular submissions, 68 MSs were submitted to the *TAR* Quality of Earnings Conference.
** Projects out to 410 new submissions for 2005.

The **acceptance rate** (defined as number of MSs accepted divided by the number of new submissions) over the past 5 years is between 12–16% per year.

EDITORIAL POLICY AND STYLE INFORMATION

EDITORIAL POLICY

According to the policies set by the Publications Committee (which were endorsed by the Executive Committee and were published in the *Accounting Education News*, June 1987), *The Accounting Review* "should be viewed as the premier journal for publishing articles reporting the results of accounting research and explaining and illustrating related research methodology. The scope of acceptable articles should embrace any research methodology and any accounting-related subject, as long as the articles meet the standards established for publication in the journal ... No special sections should be necessary. The primary, but not exclusive, audience should be—as it is now—academicians, graduate students, and others interested in accounting research."

The primary criterion for publication in *The Accounting Review* is the significance of the contribution an article makes to the literature.

The efficiency and effectiveness of the editorial review process is critically dependent upon the actions of both authors submitting papers and the reviewers. Authors accept the responsibility of preparing research papers at a level suitable for evaluation by independent reviewers. Such preparation, therefore, should include subjecting the manuscript to critique by colleagues and others and revising it accordingly prior to submission. The review process is not to be used as a means of obtaining feedback at early stages of developing the research.

Reviewers and associate editors are responsible for providing critically constructive and prompt evaluations of submitted research papers based on the significance of their contribution and on the rigor of analysis and presentation. Associate editors also make editorial recommendations to the editor.

MANUSCRIPT PREPARATION AND STYLE

The Accounting Review's manuscript preparation guidelines follow (with a slight modification) the B-format of *The Chicago Manual of Style* (15th ed.; University of Chicago Press). Another helpful guide to usage and style is *The Elements of Style*, by William Strunk, Jr., and E. B. White (Macmillan). Spelling follows *Webster's Collegiate Dictionary.*

FORMAT

1. All manuscripts should be typed in 12-point font on one side of $8\frac{1}{2} \times 11''$ good quality paper and be double-spaced, except for indented quotations.
2. Manuscripts should be as concise as the subject and research method permit, generally not to exceed 7,000 words.
3. Margins of at least one inch from top, bottom, and sides should facilitate editing and duplication.
4. To promote anonymous review, authors should not identify themselves directly or indirectly in their papers or in experimental test instruments included with the submission. Single authors should not use the editorial "we."
5. A cover page should show the title of the paper, the author's name, title and affiliation, email address, any acknowledgments, and a footnote indicating whether the author would be willing to share the data (see last paragraph in this statement).

Pagination: All pages, including tables, appendices and references, should be serially numbered. Major sections should be numbered in Roman numerals. Subsections should not be numbered.

Numbers: Spell out numbers from one to ten, except when used in tables and lists, and when used with mathematical, statistical, scientific, or technical units and quantities, such as distances, weights and measures. For example: *three days; 3 kilometers; 30 years.* All other numbers are expressed numerically.

Percentages and Decimal Fractions: In nontechnical copy use the word percent in the text.

Hyphens: Use a hyphen to join unit modifiers or to clarify usage. For example: *a well-presented analysis; re-form.* See *Webster's* for correct usage.

Keywords: The abstract is to be followed by four keywords that will assist in indexing the paper.

ABSTRACT/INTRODUCTION

An Abstract of about 100 words should be presented on a separate page immediately preceding the text. The Abstract should concisely inform the reader of the manuscript's topic, its methods, and its findings. Keywords and the Data Availability statements should follow the Abstract. The text of the paper should start with a section labeled "I. Introduction," which provides more details about the paper's purpose, motivation, methodology, and findings. Both the Abstract and the Introduction should be relatively nontechnical, yet clear enough for an informed reader to understand the manuscript's contribution. The manuscript's title, but neither the author's name nor other identification designations, should appear on the Abstract page.

TABLES AND FIGURES

The author should note the following general requirements:

1. Each table and figure (graphic) should appear on a separate page and should be placed at the end of the text. Each should bear an Arabic number and a complete title indicating the exact contents of the table or figure. Tables and figures should define each variable. The titles and definitions should be sufficiently detailed to enable the reader to interpret the tables and figures without reference to the text.
2. A reference to each graphic should be made in the text.
3. The author should indicate by marginal notation where each graphic should be inserted in the text.
4. Graphics should be reasonably interpreted without reference to the text.
5. Source lines and notes should be included as necessary.

Equations: Equations should be numbered in parentheses flush with the right-hand margin.

DOCUMENTATION

Citations: Work cited should use the "author-date system" keyed to a list of works in the reference list (see below). Authors should make an effort to include the relevant page numbers in the cited works.

1. In the text, works are cited as follows: authors' last name and date, without comma, in parentheses: for example, (Jones 1987); with two authors: (Jones and Freeman 1973); with more than two: (Jones et al. 1985); with more than one source cited together (Jones 1987; Freeman 1986); with two or more works by one author: (Jones 1985, 1987).
2. Unless confusion would result, do not use "p." or "pp." before page numbers: for example, (Jones 1987, 115).
3. When the reference list contains more than one work of an author published in the same year, the suffix a, b, etc. follows the date in the text citation: for example, (Jones 1987a) or (Jones 1987a; Freeman 1985b).
4. If an author's name is mentioned in the text, it need not be repeated in the citation; for example, "Jones (1987, 115) says ..."
5. Citations to institutional works should use acronyms or short titles where practicable; for example, (AAA ASOBAT 1966); (AICPA Cohen Commission Report 1977). Where brief, the full title of an institutional work might be shown in a citation: for example, (ICAEW *The Corporate Report* 1975).
6. If the manuscript refers to statutes, legal treatises or court cases, citations acceptable in law reviews should be used.

Reference List: Every manuscript must include a list of references containing only those works cited. Each entry should contain all data necessary for unambiguous identification. With the author-date system, use the following format recommended by *The Chicago Manual*:

1. Arrange citations in alphabetical order according to surname of the first author or the name of the institution responsible for the citation.
2. Use author's initials instead of proper names.
3. Date of publication should be placed immediately after author's name.
4. Titles of journals should not be abbreviated.
5. Multiple works by the same author(s) in the same year are distinguished by letters after the date.
6. Inclusive page numbers are treated as recommended in *Chicago Manual* section 6.83.

Sample entries are as follows:

American Accounting Association, Committee on Concepts and Standards for External Financial Reports. 1977. *Statement on Accounting Theory and Theory Acceptance*. Sarasota, FL: AAA.

Demski, J. S., and D. E. M. Sappington. 1989. Hierarchical structure and responsibility accounting. *Journal of Accounting Research* 27 (Spring): 40–58.
Dye, R., B. Balachandran, and R. Magee. 1989. Contingent fees for audit firms. Working paper, Northwestern University, Evanston, IL.
Fabozzi, F., and I. Pollack, eds. 1987. *The Handbook of Fixed Income Securities.* 2nd edition. Homewood, IL: Dow Jones-Irwin.
Kahneman, D., P. Slovic, and A. Tversky, eds. 1982. *Judgment Under Uncertainty: Heuristics and Biases.* Cambridge, U.K.: Cambridge University Press.
Porcano, T. M. 1984a. Distributive justice and tax policy. *The Accounting Review* 59 (October): 619–636.
———. 1984b. The perceived effects of tax policy on corporate investment intentions. *The Journal of the American Taxation Association* 6 (Fall): 7–19.
Shaw, W. H. 1985. Empirical evidence on the market impact of the safe harbor leasing law. Ph.D. dissertation, The University of Texas at Austin.
Sherman, T. M., ed. 1984. *Conceptual Framework for Financial Accounting.* Cambridge, MA: Harvard Business School.

Footnotes: Footnotes are not used for documentation. Textual footnotes should be used only for extensions and useful excursions of information that if included in the body of the text might disrupt its continuity. Footnotes should be consecutively numbered throughout the manuscript with superscript Arabic numerals. Footnote text should be doubled-spaced and placed at the end of the article.

SUBMISSION OF MANUSCRIPTS

Authors should note the following guidelines for submitting manuscripts:

1. Manuscripts currently under consideration by another journal or publisher should not be submitted. The author must state that the work is not submitted or published elsewhere.
2. In the case of manuscripts reporting on field surveys or experiments, four copies of the instrument (questionnaire, case, interview plan, or the like) should be submitted. Information that might identify the author(s) must be deleted from the instrument.
3. MS should be submitted via email as Microsoft® Word or PDF files to the *TAR* office at TARUAZ@email.arizona.edu. A submission letter, a separate cover page, and the MS containing no author identification should be emailed as separate files. The submission fee should be paid online (VISA or MasterCard only) at: https://aaahq.org/AAAforms/journals/tarsubmit.cfm. If unable to pay online, a check in U.S. funds, made payable to the American Accounting Association, may be sent to Professor Dan Dhaliwal, Senior Editor, *The Accounting Review*, The University of Arizona, Department of Accounting, McClelland Hall 301, 1130 E. Helen Street, Tucson, AZ 85721-0108. The submission fee in U.S. funds is $125.00 for members and $200.00 for nonmembers of the AAA. Effective January 1990, the submission fee is nonrefundable.
4. The author should retain a copy of the paper.
5. Revisions must be submitted within 12 months from request, otherwise they will be considered new submissions.

COMMENTS

Comments on articles previously published in *The Accounting Review* will be reviewed (anonymously) by two reviewers in sequence. The first reviewer will be the author of the original article being subjected to critique. If substance permits, a suitably revised comment will be sent to a second reviewer to determine its publishability in *The Accounting Review.* If a comment is accepted for publication, the original author will be invited to reply. All other editorial requirements, as enumerated above, also apply to proposed comments.

POLICY ON REPRODUCTION

An objective of *The Accounting Review* is to promote the wide dissemination of the results of systematic scholarly inquiries into the broad field of accounting.

Permission is hereby granted to reproduce any of the contents of the *Review* for use in courses of instruction, as long as the source and American Accounting Association copyright are indicated in any such reproductions.

Written application must be made to the American Accounting Association, 5717 Bessie Drive, Sarasota, FL 34233-2399, for permission to reproduce any of the contents of the *Review* for use in other than courses of instruction—e.g., inclusion in books of readings or in any other publications intended for general distribution. In consideration for the grant of permission by the *Review* in such instances, the applicant must notify the author(s) in writing of the intended use to be made of each reproduction. Normally, the *Review* will not assess a charge for the waiver of copyright.

Except where otherwise noted in articles, the copyright interest has been transferred to the American Accounting Association. Where the author(s) has (have) not transferred the copyright to the Association, applicants must seek permission to reproduce (for all purposes) directly from the author(s).

POLICY ON DATA AVAILABILITY

The following policy has been adopted by the Executive Committee in its April 1989 meeting. "An objective of (*The Accounting Review, Accounting Horizons, Issues in Accounting Education*) is to provide the widest possible dissemination of knowledge based on systematic scholarly inquiries into accounting as a field of professional research, and educational activity. As part of this process, authors are encouraged to make their data available for use by others in extending or replicating results reported in their articles. Authors of articles which report data dependent results should footnote the status of data availability and, when pertinent, this should be accompanied by information on how the data may be obtained."

AUTHOR INDEX TO VOLUME 20

Author	*Title*	*Page*
ALTAMURO, JENNIFER (and BEATTY and WEBER)	The Effects of Accelerated Revenue Recognition on Earnings Management and Earnings Informativeness: Evidence from SEC Staff Accounting Bulletin No. 101	373
BARRON, ORIE E. (and HARRIS and STANFORD)	Evidence That Investors Trade on Private Event-Period Information around Earnings Announcements	403
BEATTY, ANNE L. (and ALTAMURO and WEBER)	The Effects of Accelerated Revenue Recognition on Earnings Management and Earnings Informativeness: Evidence from SEC Staff Accounting Bulletin No. 101	373
BHOJRAJ, SANJEEV (and LIBBY)	Capital Market Pressure, Disclosure Frequency-Induced Earnings/Cash Flow Conflict, and Managerial Myopia	1
BOTOSAN, CHRISTINE A. (and PLUMLEE)	Assessing Alternative Proxies for the Expected Risk Premium	21
BOTOSAN, CHRISTINE A. (and STANFORD)	Managers' Motives to Withhold Segment Disclosures and the Effect of SFAS No. 131 on Analysts' Information Environment	751
BOWEN, ROBERT M. (and DAVIS and MATSUMOTO)	Emphasis on Pro Forma versus GAAP Earnings in Quarterly Press Releases: Determinants, SEC Intervention, and Market Reactions	1011
BROWN, LAWRENCE D.	The Importance of Circulating and Presenting Manuscripts: Evidence from the Accounting Literature	55
BROWN, LAWRENCE D. (and CAYLOR)	A Temporal Analysis of Quarterly Earnings Thresholds: Propensities and Valuation Consequences	423
CAYLOR, MARCUS L. (and BROWN)	A Temporal Analysis of Quarterly Earnings Thresholds: Propensities and Valuation Consequences	423
CHENG, QIANG	What Determines Residual Income?	85
CHENG, QIANG (and WARFIELD)	Equity Incentives and Earnings Management	441
COLETTI, ANGELA L. (and SEDATOLE and TOWRY)	The Effect of Control Systems on Trust and Cooperation in Collaborative Environments	477

DATTA, SUNIL (and REICHELSTEIN)	Stock Price, Earnings, and Book Value in Managerial Performance Measures	1069
DAVILA, ANTONIO (and FOSTER)	Management Accounting Systems Adoption Decisions: Evidence and Performance Implications from Startup Companies	1039
DAVIS, ANGELA K. (and BOWEN and MATSUMOTO)	Emphasis on Pro Forma versus GAAP Earnings in Quarterly Press Releases: Determinants, SEC Intervention, and Market Reactions	1011
EASTON, PETER D. (and MONAHAN)	An Evaluation of Accounting-Based Measures of Expected Returns	501
ETTREDGE, MICHAEL L. (and KWON and SMITH and ZAROWIN)	The Impact of SFAS No. 131 Business Segment Data on the Market's Ability to Anticipate Future Earnings	773
EWERT, RALF (and WAGENHOFER)	Economic Effects of Tightening Accounting Standards to Restrict Earnings Management	1101
FARBER, DAVID B.	Restoring Trust after Fraud: Does Corporate Governance Matter?	539
FISHER, JOSEPH G. (and MAINES and PEFFER and SPRINKLE)	An Experimental Investigation of Employer Discretion in Employee Performance Evaluation and Compensation	563
FOSTER, GEORGE (and DAVILA)	Management Accounting Systems Adoption Decisions: Evidence and Performance Implications from Startup Companies	1039
FRANCIS, JERE R. (and REICHELT and WANG)	The Pricing of National and City-Specific Reputations for Industry Expertise in the U.S. Audit Market	113
FRANCIS, JERE R. (and KHURANA and PEREIRA)	Disclosure Incentives and Effects on Cost of Capital around the World	1125
GHOSH, ALOKE (and MOON)	Audit Tenure and Perceptions of Audit Quality	585
HAND, JOHN R. M.	The Value Relevance of Financial Statements in the Venture Capital Market	613

HANLON, MICHELLE	The Persistence and Pricing of Earnings, Accruals, and Cash Flows When Firms Have Large Book-Tax Differences	137
HANNAN, R. LYNN	The Combined Effect of Wages and Firm Profit on Employee Effort	167
HARRIS, DAVID G. (and BARRON and STANFORD)	Evidence That Investors Trade on Private Event-Period Information around Earnings Announcements	403
HERRMANN, DON (and THOMAS)	Rounding of Analyst Forecasts	805
HOBSON, JESSEN L. (and KACHELMEIER)	Strategic Disclosure of Risky Prospects: A Laboratory Experiment	825
JOOS, PETER (and PLESKO)	Valuing Loss Firms	847
KACHELMEIER, STEVEN J. (and HOBSON)	Strategic Disclosure of Risky Prospects: A Laboratory Experiment	825
KHURANA, INDER K. (and FRANCIS and PEREIRA)	Disclosure Incentives and Effects on Cost of Capital around the World	1125
KIMBROUGH, MICHAEL D.	The Effect of Conference Calls on Analyst and Market Underreaction to Earnings Announcements	189
KOONCE, LISA L. (and McANALLY and MERCER)	How Do Investors Judge the Risk of Financial Items?	221
KOONCE, LISA L. (and LIPE and McANALLY)	Judging the Risk of Financial Instruments: Problems and Potential Remedies	871
KRISCHE, SUSAN D.	Investors' Evaluations of Strategic Prior-Period Benchmark Disclosures in Earnings Announcements	243
KRISHNAN, JAYANTHI	Audit Committee Quality and Internal Control: An Empirical Analysis	649
KRISHNAN, RANJANI	The Effect of Changes in Regulation and Competition on Firms' Demand for Accounting Information	269

KRISHNAN, RANJANI (and LUFT and SHIELDS)	Effects of Accounting-Method Choices on Subjective Performance-Measure Weighting: Experimental Evidence on Precision and Error Covariance	1163
KWON, SOO YOUNG (and ETTREDGE and SMITH and ZAROWIN)	The Impact of SFAS No. 131 Business Segment Data on the Market's Ability to Anticipate Future Earnings	773
LIBBY, ROBERT (and BHOJRAJ)	Capital Market Pressure, Disclosure Frequency-Induced Earnings/Cash Flow Conflict, and Managerial Myopia	1
LIPE, MARLYS GASCHO (and KOONCE and McANALLY)	Judging the Risk of Financial Instruments: Problems and Potential Remedies	871
LIU, XIAOHONG (and SIMUNIC)	Profit Sharing in an Auditing Oligopoly	677
LUFT, JOAN L. (and KRISHNAN and SHIELDS)	Effects of Accounting-Method Choices on Subjective Performance-Measure Weighting: Experimental Evidence on Precision and Error Covariance	1163
MAGRO, ANNE M.	Knowledge, Adaptivity, and Performance in Tax Research	703
MAINES, LAUREEN A. (and FISHER and PEFFER and SPRINKLE)	An Experimental Investigation of Employer Discretion in Employee Performance Evaluation and Compensation	563
MATSUMOTO, DAWN A. (and BOWEN and DAVIS)	Emphasis on Pro Forma versus GAAP Earnings in Quarterly Press Releases: Determinants, SEC Intervention, and Market Reactions	1011
McANALLY, MARY LEA (and KOONCE and MERCER)	How Do Investors Judge the Risk of Financial Items?	221
McANALLY, MARY LEA (and KOONCE and LIPE)	Judging the Risk of Financial Instruments: Problems and Potential Remedies	871
MERCER, MOLLY (and KOONCE and McANALLY)	How Do Investors Judge the Risk of Financial Items?	221
MERCER, MOLLY	The Fleeting Effects of Disclosure Forthcomingness on Management's Reporting Credibility	723

MITTENDORF, BRIAN (and ZHANG)	The Role of Biased Earnings Guidance in Creating a Healthy Tension between Managers and Analysts	1193
MOHD, EMAD	Accounting for Software Development Costs and Information Asymmetry	1211
MONAHAN, STEVEN J. (and EASTON)	An Evaluation of Accounting-Based Measures of Expected Returns	501
MOON, DOOCHEOL (and GHOSH)	Audit Tenure and Perceptions of Audit Quality	585
NELSON, MARK W. (and SMITH and PALMROSE)	The Effect of Quantitative Materiality Approach on Auditors' Adjustment Decisions	897
NEWMAN, PAUL D. (and PATTERSON and SMITH)	The Role of Auditing in Investor Protection	289
O'DONNELL, ED (and SCHULTZ)	The Halo Effect in Business Risk Audits: Can Strategic Risk Assessment Bias Auditor Judgment about Accounting Details?	921
PALMROSE, ZOE-VONNA (and NELSON and SMITH)	The Effect of Quantitative Materiality Approach on Auditors' Adjustment Decisions	897
PATTERSON, EVELYN R. (and NEWMAN and SMITH)	The Role of Auditing in Investor Protection	289
PEFFER, SEAN A. (and FISHER and MAINES and SPRINKLE)	An Experimental Investigation of Employer Discretion in Employee Performance Evaluation and Compensation	563
PEREIRA, RAYNOLDE (and FRANCIS and KHURANA)	Disclosure Incentives and Effects on Cost of Capital around the World	1125
PLESKO, GEORGE A. (and JOOS)	Valuing Loss Firms	847
PLUMLEE, MARLENE A. (and BOTOSAN)	Assessing Alternative Proxies for the Expected Risk Premium	21
POWNALL, GRACE (and SIMKO)	The Information Intermediary Role of Short Sellers	941

RANDOLPH, DAVID W. (and SALAMON and SEIDA)	Quantifying the Costs of Intertemporal Taxable Income Shielding: Theory and Evidence from the Property-Casualty Insurance Industry	315
REICHELSTEIN, STEFAN (and DATTA)	Stock Price, Earnings, and Book Value in Managerial Performance Measures	1069
REICHELT, KENNETH (and FRANCIS and WANG)	The Pricing of National and City-Specific Reputations for Industry Expertise in the U.S. Audit Market	113
ROGERS, JONATHAN L. (and STOCKEN)	Credibility of Management Forecasts	1233
SALAMON, GERALD L. (and RANDOLPH and SEIDA)	Quantifying the Costs of Intertemporal Taxable Income Shielding: Theory and Evidence from the Property-Casualty Insurance Industry	315
SCHULTZ, JR., JOSEPH J. (and O'DONNELL)	The Halo Effect in Business Risk Audits: Can Strategic Risk Assessment Bias Auditor Judgment about Accounting Details?	921
SEDATOLE, KAREN L. (and COLETTI and TOWRY)	The Effect of Control Systems on Trust and Cooperation in Collaborative Environments	477
SEIDA, JIM A. (and RANDOLPH and SALAMON)	Quantifying the Costs of Intertemporal Taxable Income Shielding: Theory and Evidence from the Property-Casualty Insurance Industry	315
SHIELDS, MICHAEL D. (and KRISHNAN and LUFT)	Effects of Accounting-Method Choices on Subjective Performance-Measure Weighting: Experimental Evidence on Precision and Error Covariance	1163
SIMKO, PAUL J. (and POWNALL)	The Information Intermediary Role of Short Sellers	941
SIMUNIC, DAN A. (and LIU)	Profit Sharing in an Auditing Oligopoly	677
SMITH, DAVID B. (and ETTREDGE and KWON and ZAROWIN)	The Impact of SFAS No. 131 Business Segment Data on the Market's Ability to Anticipate Future Earnings	773
SMITH, J. REED (and NEWMAN and PATTERSON)	The Role of Auditing in Investor Protection	289

SMITH, STEVEN D. (and NELSON and PALMROSE)	The Effect of Quantitative Materiality Approach on Auditors' Adjustment Decisions	897
SPRINKLE, GEOFFREY B. (and FISHER and MAINES and PEFFER)	An Experimental Investigation of Employer Discretion in Employee Performance Evaluation and Compensation	563
STANFORD, MARY (and BARRON and HARRIS)	Evidence That Investors Trade on Private Event-Period Information around Earnings Announcements	403
STANFORD, MARY (and BOTOSAN)	Managers' Motives to Withhold Segment Disclosures and the Effect of SFAS No. 131 on Analysts' Information Environment	751
STOCKEN, PHILLIP C. (and ROGERS)	Credibility of Management Forecasts	1233
THOMAS, WAYNE B. (and HERRMANN)	Rounding of Analyst Forecasts	805
TOWRY, KRISTY L. (and COLETTI and SEDATOLE)	The Effect of Control Systems on Trust and Cooperation in Collaborative Environments	477
TROTMAN, KEN T. (and WRIGHT and WRIGHT)	Auditor Negotiations: An Examination of the Efficacy of Intervention Methods	349
WAGENHOFER, ALFRED (and EWERT)	Economic Effects of Tightening Accounting Standards to Restrict Earnings Management	1101
WANG, DECHUN (and FRANCIS and REICHELT)	The Pricing of National and City-Specific Reputations for Industry Expertise in the U.S. Audit Market	113
WARFIELD, TERRY D. (and CHENG)	Equity Incentives and Earnings Management	441
WEBER, JOSEPH (and ALTAMURO and BEATTY)	The Effects of Accelerated Revenue Recognition on Earnings Management and Earnings Informativeness: Evidence from SEC Staff Accounting Bulletin No. 101	373
WRIGHT, ARNOLD M. (and TROTMAN and WRIGHT)	Auditor Negotiations: An Examination of the Efficacy of Intervention Methods	349

WRIGHT, SALLY (and TROTMAN *and WRIGHT*)	Auditor Negotiations: An Examination of the Efficacy of Intervention Methods	349
WYATT, ANNE	Accounting Recognition of Intangible Assets: Theory and Evidence on Economic Determinants	967
ZAROWIN, PAUL A. (and ETTREDGE and KWON and SMITH)	The Impact of SFAS No. 131 Business Segment Data on the Market's Ability to Anticipate Future Earnings	773
ZHANG, YUN (and MITTENDORF)	The Role of Biased Earnings Guidance in Creating a Healthy Tension between Managers and Analysts	1193

OCTOBER 2005 PLACEMENT ADS

The deadline for information to be included in the "Placement Information" section is two months prior to the date of publication. The ***Review*** *is published in January, April, July, and October. Placement advertising and replies should be sent to the American Accounting Association, 5717 Bessie Drive, Sarasota, FL 34233-2399, ATTENTION: ADVERTISING DEPT. All replies to box numbers should be on separate sheets to facilitate forwarding.*

401 UNIVERSITY OF SOUTH FLORIDA seeks a visionary and dynamic Dean for the College of Business Administration. Minimum qualifications include an earned doctorate and a distinguished record of scholarly achievement appropriate for appointment as a tenured Full Professor in an academic department of the College, and academic administrative experience at an AACSB-accredited college/school of business. Preferred qualifications include an outstanding record of academic leadership, Fiscal and Human Resource Management, as well as community engagement and fund-raising; also a record of outstanding administrative experience as a Department Chair, Associate Dean, or higher. Additional qualifications include a demonstrated record of commitment to excellence in teaching and research; significant achievement in the recruitment and retention of diverse and high-quality faculty, staff, and students; a record of successful collaborative initiatives with interdisciplinary scholarship in partnership with local, state, national, and international communities; and outstanding communication and interpersonal skills. For more detailed information, please visit our website http://www.usf.edu/employ.html.

402 UNIVERSITY OF MARYLAND seeks applicants for a continuing non-tenure-track teaching position in Accounting. The position is for nine months beginning August 2006, and is renewable subject to performance. Off-term teaching is available. Candidates must possess a doctorate and an excellent teaching record, especially at the Master's level. Teaching breadth will be valued. Certain student support and service responsibilities will be expected. Send a *curriculum vitae*, three letters of recommendation, and evidence of teaching effectiveness to: Professor Oliver Kim, The Robert H. Smith School of Business, University of Maryland, College Park, MD 20742-1815. The University of Maryland is an Equal Opportunity/Affirmative Action Employer. Women and minorities are especially encouraged to apply.

403 EASTERN MICHIGAN UNIVERSITY seeks applicants for a tenure-track Assistant Professor position to begin Fall 2006, subject to availability of funding. A primary interest in Financial or Managerial Accounting and a secondary interest in Taxation are desired. A Ph.D. or D.B.A. with a major in Accounting from an AACSB-accredited school or its equivalent is required; however, an ABD with substantial evidence of completion will be considered; CPA or other professional certifications and teaching experience desired. Salary is competitive. EMU is a public, comprehensive university of 25,000 students in southeastern Michigan and the College of Business is AACSB-accredited. Submit letter, *curriculum vitae*, transcripts, teaching evaluations, and three reference letters to: Accounting Faculty Position, EMU Academic Human Resources, 202 Boone Hall, Ypsilanti, MI 48197. Review of applications will start immediately and continue until the positions are filled. For more information, contact Dr. Susan Kattelus at susan.kattelus@emich.edu and visit our website http://www.accfin.emich.edu/. AA/EOE.

404 UNIVERSITY OF NOTRE DAME, Department of Accountancy, invites applications for position openings at the Assistant and Associate Professor levels. All research areas will be considered. Applicants for Assistant Professor positions should expect to complete doctoral degree requirements before the start of the contract period. All candidates should have a strong commitment to scholarly research and excellence in teaching. Salary is very competitive and research support is excellent. Please send *curriculum vitae* and an example of scholarly work to: Professor Tom Schaefer, Chair, Department of Accountancy, Room 102D, Mendoza College of Business Administration, University of Notre Dame, Notre Dame, IN 46556-5646. The University of Notre Dame is an Equal Opportunity, Affirmative Action Employer.

405 KENT STATE UNIVERSITY, Department of Accounting, invites applications for an Assistant Professor with teaching emphasis primarily in Managerial Accounting beginning in Fall 2006. Individuals with interest in Financial Accounting will also be considered. Hiring of an applicant with a quality, established research record is preferred. The successful candidate may also serve as a KPMG Faculty Fellow. A Ph.D. with a major in Accounting or an appropriate related field is required. Professional certification such as CMA or CPA is highly desirable. The preferred candidate should be able to demonstrate evidence of discovery/integration research and of effective teaching. Research will be expected in high-quality, academic refereed journals. Service on and/or supervising doctoral students' dissertations will be part of the faculty member's responsibilities. Review of applications will begin immediately and continue until the position is filled. If you are interested in this position, please contact and/or mail a copy of your resume to: Dr. Pervaiz Alam Chair, Faculty Search Committee Department of Accounting, 576 BSA, Kent State University, Kent, OH 44242; Phone (330) 672-1121; Fax (330) 672-2548; Email: palam@bsa3.kent.edu.

406 RUTGERS UNIVERSITY, Camden, School of Business, invites applications for a tenure-track faculty position as Assistant or Associate Professor in the area of Managerial/Cost or Tax accounting. The candidate should be capable of high-quality research and teaching at both the undergraduate and graduate levels. Candidates should possess a Ph.D. in Accounting or expect to complete degree before the start of contract. The University is located in southern New Jersey, with easy access to Philadelphia, New York, and Atlantic City A letter of application and *curriculum vitae* should be submitted, in writing and electronically (sungsoo@camden.rutgers.edu) to: Professor Sungsoo Kim, Coordinator, Accounting Area, School of Business, Rutgers University, Camden, NJ 08102. Rutgers University is an Equal Opportunity Employer.

407 LONG ISLAND UNIVERSITY, C.W. POST CAMPUS, College of Management, invites applications for Director of the School of Professional Accountancy. The successful candidate will hold an earned doctorate and have a demonstrated record of scholarly achievement and effective teaching. CPA licensure and previous administrative experience are highly desirable. The School seeks a leader who will promote and foster excellence in student learning, faculty and curriculum development, interaction with alumni and the professional community, and expansion of the quality and quantity of the student body. The search will continue until the position is filled. A letter of application, references, and *curriculum vitae* should be submitted to: Dr. Charles Barragato, Personnel Committee, School of Professional Accountancy, Long Island University, C.W. Post Campus, 720 Northern Boulevard, Brookville, NY 11548-1300; Email: Charles.Barragato@liu.edu. For additional information, please visit the website http://www.cwpost.liunet.edu/cwis/cwp/colofman/account/index.html. Long Island University is an Equal Opportunity Educator and Employer. Minority and women candidates are especially urged to reply.

408 MONTANA STATE UNIVERSITY, College of Business, seeks applicants to fill one tenure-track position in Accounting for Fall 2006 or earlier. Montana State University has an enrollment of approximately 12,000 students and is located in Bozeman, an attractive, culturally alive small city, 90 miles north of Yellowstone National Park. Fully accredited by the AACSB, the College of Business offers a Bachelor of Science in Business with options in Accounting, Finance, Management, and Marketing, and a Master of Professional Accountancy. Colleagues in all areas of Accounting will be considered, however, our greatest teaching needs are in the areas of Systems and Accounting Theory/Research. In addition, research activities and service consistent with the College's mission are expected. The position requires a Ph.D. or D.B.A. in Accounting or a closely related field from an AACSB-accredited university. Preference will be given to those who have completed their doctoral degrees or will complete them prior to beginning work at Montana State University. For more information and complete job descriptions with application requirements and deadlines, please visit the website http://www.montana.edu/msuinfo/jobs/faculty/ or contact: Anne L. Christensen, Email: annec@montana.edu; Phone: (406) 994-2043. ADA/AA/EO/Veteran's Preference.

409 ST. JOSEPH'S UNIVERSITY, Department of Accounting in the Haub School of Business, invites applications for an anticipated tenure-track opening to begin August 2006. Applicants with a specialty in Financial Accounting and/or Managerial Accounting will be considered at the Assistant Professor rank. The position requires that the doctoral degree in Accounting be completed, or near completion by the date of appointment. CPA is desired. Faculty are expected to teach undergraduate and graduate courses, be actively involved in academic research, and provide service to the profession and the university. Review of applications will begin August 1, 2003. St. Joseph's University is a private, Catholic, Jesuit institution with a business day and evening enrollment of 4,300. Please send a letter of application, *curriculum vitae*, and references to: Joseph M. Ragan, Chair, Department of Accounting, Saint Joseph's University, 5600 City Avenue, Philadelphia, PA 19131-1395; Phone: (610) 660-1654.

410 CALIFORNIA POLYTECHNIC STATE UNIVERSITY, SAN LUIS OBISPO, Accounting Area, Orfalea College of Business, invites applications for one or two full-time Assistant/Associate Professor tenure-track positions beginning September 18, 2006. Salary will be commensurate with qualifications and experience. Candidate must have doctorate or equivalent degree in Accounting or closely related field from AACSB- or equivalently accredited institution. All areas of Accounting will be considered; preference will be given to Financial Accounting. Applicants must demonstrate a strong teaching and research record or currency in professional field. To apply, visit https://www.calpolyjobs.org/ and complete a required online faculty application. Submit application and supplementary materials to: Requisition #100612. Fax is also available: Eddy Quijano at (805) 756-6347. Position will remain open until filled; for full consideration, apply by September 30, 2005. Applications received after that date may be considered. Cal Poly is strongly committed to achieving excellence through cultural diversity. The university actively encourages applications and nominations of all qualified individuals. EEO.

411 PORTLAND STATE UNIVERSITY invites applications for a tenure-track position in Accounting effective September 2006. Rank is open; Assistant/Associate Professor preferred. Doctoral degree in Accounting and commitment to teaching and research excellence are required. Teaching emphasis in Financial Accounting is required. Preference will be given to applicants demonstrating a successful, ongoing program of research compatible with the research interests of existing faculty and to candidates with academic/professional work experience. The Center for Professional Integrity and Accountability supports scholarly investigation, educational innovation, and community interaction related to the role of Accounting. Please visit our website http://www.sba.pdx.edu/. Review of applications begins October 31, 2005 and continues until finalists are identified. Send application letter, *curriculum vitae*, three letters of recommendation, evidence of teaching effectiveness, and examples of recent scholarly work to: Dr. Donna Philbrick, School of Business Administration, Portland State University, PO Box 751, Portland, OR 97207-0751. PSU is an Affirmative Action/Equal Opportunity Institution and welcomes applications from diverse candidates and candidates who support diversity.

412 TRINITY UNIVERSITY invites applications for the position of the Jesse H. Jones Distinguished Professor of Accounting within the Department of Business Administration, effective August 2006. The position requires a Ph.D., D.B.A., or equivalent degree in Accounting. An established record of research, a commitment to continued scholarship, and excellence in teaching are required. The teaching load is two courses per semester. The Jesse H. Jones Distinguished Professor will be expected to have an interest in teaching Financial Accounting Theory and Regulation. The salary is competitive. The Department of Business Administration at Trinity University is the largest academic unit on campus in terms of student majors and is accredited by the AACSB. The Department offers bachelor's and master's degrees in Accounting. Applicants should send a letter of interest, *curriculum vitae*, and a sample of written work to: Dr. Daniel T. Walz, Chair of Search Committee, Department of Business Administration, Trinity University, One Trinity Place, San Antonio, Texas 78212-7200; Email: dwalz@trinity.edu. Review of applications will begin immediately, and the position will remain open until filled. We encourage applications from women and minorities. The University is an Equal Opportunity Employer.

413 WASHINGTON STATE UNIVERSITY invites applications for one or more Accounting faculty positions at the Assistant, Associate, or Professor level, beginning August 16, 2006. An endowed professorship may be available for candidates with exemplary research and teaching portfolios. A doctorate or ABD in Accounting, a record of published research or research potential, and evidence of effective teaching are required. A demonstrated interest in Behavioral Accounting Research is desirable. Candidates from all areas of Accounting will be considered. The successful candidate will receive a six-hour semester teaching load, summer research support, competitive salary, and excellent fringe benefits. Review of applications begins September 16, 2005 and continues until the position is filled. Send letter of application, resume, student teaching evaluations (or summary), recent research paper, and three letters of recommendation to: John T. Sweeney, Accounting Search Chair, Department of Accounting, Box 644729, Washington State University, Pullman, WA 99164-4729. WSU is an EO/AA Educator and Employer. Protected groups are encouraged to apply.

414 LEHIGH UNIVERSITY seeks a well-trained scholar who will publish in major refereed journals, and who also has a strong commitment to teaching, to join its Accounting faculty in Fall 2006. The opening is for an Assistant Professor. A college with a recently acquired Perella endowment of $10M and national aspirations, a very successful M.S. in Accounting program, and a dynamic Accounting Department make this a great time to consider Lehigh. Although our greatest need is Auditing, we will consider candidates in other areas. Applications will be accepted until the position is filled. If interested, send your *curriculum vitae*, names of three references, and examples of scholarly work to: Dr. Kenneth P. Sinclair, Chair, Department of Accounting, Lehigh University, 621 Taylor Street, Bethlehem, PA 18015-3117; Email: kps1@lehigh.edu; Phone: 610-758-3431. Lehigh University is an Equal Employment/Affirmative Action Employer. Qualified women and minority candidates should apply.

415 NATIONAL TAIWAN UNIVERSITY, Department of Accounting, invites applications for positions in Accounting beginning Fall 2005 or Spring 2006. As the oldest and most prestigious business education provider in Taiwan, the Department of Accounting has a strong commitment to the principle of diversity and seeks a broad spectrum of candidates and commits to maintaining its position as a pioneer in the creation, dissemination, and application of knowledge in the Management and Business fields. The Department of Accounting offers programs at B.B.A., M.B.A., and doctorate levels. Minimum qualifications: Ph.D. in Accounting, Economics, Finance, or MIS. Candidates must have a commitment to excellence in research, teaching, and professional service. Submit your letter of application, *curriculum vitae* (including recent publications), teaching evaluations, and three letters of reference to: Pin-Jia Chen, No. 1, Sec. 4 Roosevelt Rd., Department of Accounting, National Taiwan University, Taipei, Taiwan 106. National Taiwan University is an Affirmative Action/Equal Opportunity Employer.

416 NORTH DAKOTA STATE UNIVERSITY, College of Business (AACSB), invites applications for a one-year position that may lead to a tenure-track position in the Department of Accounting and Information Systems beginning August 2005. Rank is open depending on qualifications. Preferred area is Tax, but all areas of interest will be considered. For additional information, please visit the website provided below. Minimum Qualifications: Ph.D. or D.B.A. in Accounting with research and teaching potential (ABD will be considered), good interpersonal skills, demonstrated effective written and verbal communication skills. Preferred qualifications: proven record of publications and teaching. Application Procedure: deadline is July 1, 2005 or until filled. Send application letter, *curriculum vitae*, teaching evaluations, and name, address, and phone number of at least three references to: Dr. Chuck Harter, Search Committee Chair, PO Box 5075, NDSU, Fargo, ND 58105; Email: Charles.Harter@ndsu.edu. NDSU is an Equal Opportunity Institution. Email: Charles.Harter@ndsu.edu. Website: http://www.ndsu.edu/ndsu/jobs/non_broadbanded/index.shtml.

417 Position Desired. Areas of Interest: Financial/Managerial Accounting, Auditing, Corporate Finance and Investments. Qualifications: ABD, CPA, M.B.A., M.S. (Financial Economics) and CFA Candidate. Expected graduation date: July 2006. I have professional and academic experiences. Big 5 experience as a senior auditor and financial consultant. I taught undergraduate, graduate and executive graduate courses. I have several refereed publications and proceedings. Email: PHD.CPA@GMAIL.COM; Phone: (504) 919-0294.

418 SIMON FRASER UNIVERSITY, The Faculty of Business Administration, invites applications for a tenure-track appointment in Accounting-Capital Markets, Financial Risk Assessment and/or Corporate Accounting and Finance. Ph.D. in hand or near completion required, and a professional accounting designation preferred. Rank: Assistant/Associate. Salary: competitive within Canada. Successful candidate will have strong research and teaching abilities with established research programs in the areas above and an interest in teaching at the undergraduate/graduate/executive levels and in the Faculty's innovative online graduate programs. Start date: September 2006. All qualified candidates are encouraged to apply. However, Canadians and Permanent Residents will be given priority. SFU is committed to principle of equity in employment and offers equal employment opportunities to qualified applicants. Positions are subject to budgetary approval. Send *curriculum vitae* and the names of three referees to: Appointments Committee Chair, Faculty of Business Administration, Simon Fraser University, 8888 University Drive, Burnaby, BC V5A 1S6 Canada. Websites: http://www.sfu.ca, http://www.bus.sfu.ca.

419 CALIFORNIA STATE UNIVERSITY, EAST BAY is seeking a tenure-track faculty position, rank open, in the area of financial accounting. Candidates with additional qualifications in auditing or taxation are desirable. Candidate must have an earned doctorate in Accounting no later than the date of appointment—January 2006. For additional information and conditions, please consult our website at: http://www.csuhayward.edu/OAA/ttposann.html#ACCT. Review of applications will begin on July 1, 2005 and will continue until the position is filled. Please submit a letter of application; a complete and current *curriculum vitae*; graduate transcripts; student evaluations, copies of major publications; and three letters of recommendation to: Professor Gary R. McBride, Chair, Department of Accounting and CIS, California State University, East Bay, 25800 Carlos Bee Blvd., Hayward, CA 94542: Phone: (510) 885-3397; Fax: (510) 885-4884; Email: gmcbride@csueastbay.edu; University website: http://www.csuhayward.edu; CBE website: http://www.sbe.csuhayward.edu. CSUH is an EOE.

420 CALIFORNIA STATE UNIVERSITY, EAST BAY is seeking applications for a tenure-track faculty position, rank open, in management/cost accounting. Candidates with additional qualifications in auditing or taxation are desirable. Candidate must have an earned doctorate in Accounting no later than the date of appointment—January 2006. For additional information and conditions, please consult our website at: http://www.csuhayward.edu/OAA/ttposann.html#ACCT. Review of applications will begin on July 1, 2005 and will continue until the position is filled. Please submit a letter of application; a complete and current *curriculum vitae*; graduate transcripts; student evaluations, copies of major publications; and three letters of recommendation to: Professor Gary R. McBride, Chair, Department of Accounting and CIS, California State University, East Bay, 25800 Carlos Bee Blvd., Hayward, CA 94542: Phone: (510) 885-3397; Fax: (510) 885-4884; Email: gmcbride@csueastbay.edu; University website: http://www.csuhayward.edu; CBE website: http://www.sbe.csuhayward.edu. CSUH is an EOE.

421 NORTHERN ILLINOIS UNIVERSITY anticipates assistant or associate professor tenure-track openings for accountancy faculty beginning Fall 2006. Primary needs are in Taxation, Financial Accounting, Auditing, or Managerial Accounting. NIU offers the B.S. in Accountancy, Master of Accounting Science, and Master of Science in Taxation degrees. Information about our nationally ranked program can be found at http://www.cob.niu.edu/accy/. Candidates should expect to have a Ph.D degree when employment begins. Teaching experience, business experience, and professional certification are desirable. We are interested in faculty who want to combine their research and teaching with a close working relationship with the professional business community. Applicants must send a cover letter and *curriculum vitae* to: Jim Young, Department of Accountancy, Northern Illinois University, DeKalb, IL 60115. Complete applications must be received by September 15, 2005. AA/EEO Institution.

422 STATE UNIVERSITY OF NEW YORK AT NEW PAltz, School of Business, invites applications for a faculty position in Accounting for Fall 2006. Ph.D. in Accounting required, ABDs near completion encouraged to apply. Rank and salary dependent on qualifications and competitive. The School of Business offers six B.S. degrees and M.B.A. degree programs. The University emphasizes balance between teaching and research. The primary responsibility is teaching, but an ongoing research/publication record is essential. The search will continue until the position is filled. For additional information contact the Dean at the telephone number below. Please send an application letter, resume, addresses and telephone numbers of three references, and other appropriate materials to the following address or email: Dr. Hadi Salavitabar, Dean, School of Business, State University of New York at New Paltz, 75 S. Manheim Blvd., New Paltz, New York 12561; Email: salavith@newpaltz.edu; Phone: (845) 257-2930. The State University of New York at New Paltz is an AA/EOE/ADA Employer. Women and minorities are encouraged to apply. This is an anticipated position opening and is subject to budgetary approval.

423 BRYANT UNIVERSITY, College of Business, seeks to fill a tenure-track, Assistant Professor position beginning August 1, 2006, to teach undergraduate and graduate-level courses and conduct research in Accounting Information Systems, Auditing, or Management Accounting. Candidates should be committed to teaching excellence, establishing a scholarly publication record consistent with AACSB standards, and serving as active members of the Bryant community. Ph.D. or D.B.A. from an AACSB-International accredited school, or ABD will be considered. Forward a letter of application, current *curriculum vitae*, with evidence of teaching and publishing research to: Human Resources Office—PROFJO, (428), Bryant University, 1150 Douglas Pike, Smithfield, RI 02917. Materials may be submitted electronically to humanresources@bryant.edu (Word or PDF attachments). Bryant University is a student-centered university accredited by AACSB-International and the New England Association of Schools and Colleges. Enrollment is approximately 3,000. Bryant University is an EEO/AA employer.

424 UNIVERSITY OF NEW ORLEANS invites applications for one anticipated Assistant Professor position for Spring 2006 or Fall 2006. Preference will be given to those with teaching interests in some combination of accounting systems, auditing, financial, and managerial accounting. Candidates must have the Ph.D. with an accounting major (by May 2006 for Spring hires and December 2006 for Fall hires). Salary is negotiable and competitive. The Department offers the undergraduate accounting degree (over 600 majors) and two Master's degrees (including a Tax Option). The Department has separate AACSB accounting accreditation at both the graduate and undergraduate levels. Candidates should send a resume to: Professor Philip J. Harmelink, Chairman, Department of Accounting, College of Business Administration, University of New Orleans, New Orleans, LA 70148. Email: pharmeli@uno.edu. The University of New Orleans is a member of the Louisiana State University System and an Affirmative Action, Equal Opportunity Employer.

425 CALIFORNIA STATE UNIVERSITY, FRESNO, Sid Craig School of Business, Department of Accountancy, invites applications for a tenure-track position available beginning August 2006. We seek candidates with a doctoral degree in business with an emphasis in accounting from an AACSB- or equivalently accredited institution. ABDs will be considered. Candidates must be committed to excellence in teaching; scholarly and applied research; and university and community service. Salary is dependent upon academic preparation and professional experience. Summer stipends for research are available. Please send a letter of application and *curriculum vitae* to: Dr. Denise Patterson, Faculty Search Committee Chair, Department of Accountancy, Sid Craig School of Business, California State University, Fresno, 5245 N. Backer Avenue, M/S PB7, Fresno, CA 93740-8001. Email: denisep@csufresno.edu. The complete vacancy announcement is posted at http://www.csufresno.edu/aps/vacancy/csb.html. California State University, Fresno is an Affirmative Action/Equal Opportunity Employer and has a strong commitment to the principle of diversity.

426 UNIVERSITY OF NORTH CAROLINA AT WILMINGTON invites applications for an anticipated tenure-track position in Taxation at Assistant or Associate level beginning Fall 2006. Applicants are required to have a Ph.D. in Accounting (ABD will be considered), a record of commitment to quality teaching/research. Previous professional work experience preferred. Complete applications must include a letter of application, current *curriculum vitae*, and three letters of reference. Review of applications will begin on November 1, 2005 and will continue until filled. Send application materials to: Randy Hanson, Chair, Department of Accountancy and Business Law, Cameron School of Business, The University of North Carolina at Wilmington, 601 S. College Road, Wilmington, NC, 28403-5901; Email: hansonr@uncw.edu. UNCW is an Affirmative Action, Equal Opportunity Employer. Women/minorities are encouraged to apply.

427 TSINGHUA UNIVERSITY, School of Economics and Management, invites applications in all areas of Accounting to apply for the openings in the Department of Accounting beginning October 2005. All ranks will be considered. Applicants should hold a doctorate degree in accounting. We stress high research potential or achievement. Candidates must be committed to effective teaching, scholarly and professional research, and university and community service. Rank and salary will be commensurate with qualifications and experience. Applicants should send a letter of application, current *curriculum vitae*, a sample of written work, and three letters of reference to: Dean Chunjun Zhao, School of Economics and Management, Tsinghua University, Beijing, China, 100084; or email same to Zhaochuj@em.tsinghua.edu.cn. The School offers undergraduate, Master's (including M.B.A.) and Ph.D. programs. It provides an excellent academic environment, which is significantly enhanced recently by the arrival of Special-Term Professors who have established academic records in overseas research universities. For more information, please see: http://www.em.tsinghua.edu.cn/english/Default.aspx?TabID=1.

428 CALIFORNIA STATE UNIVERSITY, CHICO, Department of Accounting and MIS, is seeking a F/T tenure-track faculty in Managerial Accounting and/or Accounting Information Systems (AIS). The minimum qualifications are a Ph.D. in Business or Accounting. Teaching and professional experience are desired. As a university that educates students of various ethnic and cultural backgrounds, we value a diverse faculty and staff. California State University, Chico is a fully accredited, state-supported member of a 23-campus CSU system serving a diverse student body of approximately 16,000. Located in the Sacramento Valley near the foothills of the Sierra Nevada mountains, Chico retains the charm of a small town with reasonable cost of living. Review of applications begins August 1, 2005. Please submit letter of interest, resume, names, addresses, and phone numbers of three references to: Dr. Gail Corbitt, Chair, Department of Accounting and MIS, California State University, Chico, Chico CA 95929-011. Website: http://www.cob.csuchico.edu/.

429 NORTHERN KENTUCKY UNIVERSITY, Department of Accountancy, invites applications for a tenure-track appointment as Assistant or Associate Professor beginning January or August 2006. Applicants must possess a Ph.D. in Accounting from an AACSB-accredited institution (or expect to complete by the date of appointment). All applicants must be academically qualified under AACSB standards and possess a commitment to teaching excellence. Preference will be given to applicants with teaching interests in Financial Accounting, Auditing, and Tax, and candidates with professional certification and accounting experience. The College of Business is AACSB-accredited. Salary and benefits are AACSB competitive. Review of applications will begin on September 1, 2005 and will continue until the position is filled. Send a *curriculum vitae* and the names of three references to: Dr. Leslie Turner, Chairman, Department of Accountancy BEP 469, Highland Heights, KY 41099. Northern Kentucky University is an Affirmative Action/Equal Opportunity Employer, M/F/D.

430 OLD DOMINION UNIVERSITY invites applications for a senior-level Accounting faculty position at the Associate/Full Professor rank beginning in the Fall 2006 semester. This position involves performing research and teaching in financial accounting and providing service to the University and the community. Candidates must have a proven track record of published research in leading accounting academic journals. Applicants must have a Ph.D. in Accounting. Screening of applicants will begin August 31, 2005 and continue until the position is filled. Salary/fringe benefits are competitive. To apply: send *curriculum vitae*, and names, addresses, and telephone numbers of three references to: Dr. Douglas E. Ziegenfuss, Chair, Department of Accounting, Constant Hall 2157, Old Dominion University, Norfolk, Virginia 23529-0229; or email: dziegenf@odu.edu. Old Dominion University is an Affirmative Action, Equal Opportunity institution and requires compliance with the Immigration Reform and Control Act of 1986.

431 OLD DOMINION UNIVERSITY invites applications for an Assistant/Associate Professor of Accounting position beginning in the Fall 2006 semester. This position involves performing research and teaching in any area of accounting but preferably in Taxation. Preference will be given to candidates with published articles in leading accounting academic journals. Applicants must have a Ph.D. in Accounting. Applicants for the Associate Professor position must have a proven track record of published research in nationally recognized refereed accounting academic journals. Screening of applicants will begin August 31, 2005 and continue until the position is filled. Salary/fringe benefits are competitive. To apply: send *curriculum vitae*, and names, addresses, and telephone numbers of three references to: Dr. Douglas E. Ziegenfuss, Chair, Department of Accounting, Constant Hall 2157, Old Dominion University, Norfolk, Virginia 23529-0229; or email: dziegenf@odu.edu. Old Dominion University is an Affirmative Action, Equal Opportunity institution and requires compliance with the Immigration Reform and Control Act of 1986.

432 SAN DIEGO STATE UNIVERSITY, School of Accountancy, invites applications for tenure-track positions in managerial, auditing, and tax at the Assistant/Associate level. Applicants should complete a Ph.D. or D.B.A. by August 2006. The School also invites applications for an advanced-rank individual who will promote and foster faculty development, student learning, and community engagement. These positions are contingent upon state funding. More detailed descriptions are available at http://www.sdsu.edu/accounting. If interested, email or send a letter with your current *curriculum vitae*, three recommendation letters, and evidence of teaching effectiveness and scholarly contributions to: Sharon Lightner, Director, School of Accountancy, SDSU, San Diego, CA 92182-8221; Phone: (619) 594-3735; Fax: (619) 594-3675; Email: sharon.lightner@sdsu.edu. SDSU is a Title IX, Equal Opportunity Employer and does not discriminate against individuals on the basis of race, religion, national origin, sexual orientation, gender, marital status, age, disability or veteran status, including veterans of the Vietnam era.

433 RIDER UNIVERSITY, Accounting Department of the College of Business Administration, invites applications for a tenure-track position. Rank for the position is open. The Accounting Department has earned Accounting Accreditation from AACSB International. An earned doctorate in accounting is required; near-term ABDs will be considered for an Assistant Professor appointment. Professional certification is a plus. Candidates at the Associate or Professor level must demonstrate a record of teaching effectiveness, scholarly contributions, and related value commensurate with the rank. Rider offers both the M.Acc. and M.B.A. degrees. Additional information is available at the department homepage of the Rider website: http://www.rider.edu. Candidates should send an application letter, *curriculum vitae*, and the names of three current references to: Manager of Employment, Rider University, 2083 Lawrenceville Road, Lawrenceville, NJ 08648-3099. Or submit to jobs@rider.edu. Inquiries about the position should be directed to Dr. Maria Sanchez at msanchez@rider.edu. Position #: 101109. AA-EOE.

434 UNIVERSITY OF NORTH CAROLINA AT GREENSBORO, Bryan School of Business and Economics, Department of Accounting, invites applications for anticipated positions at the Assistant, Associate, or Professor levels, beginning August 1, 2006. Our primary need is in financial but all areas will be considered. A doctorate in accounting or an ABD nearing completion is required. Interested candidates should submit a letter of application, *curriculum vitae*, and the names of three references to: Professor Bill Harden, Chair, Search Committee, PO Box 26165, Greensboro, NC 27402-6165. Review of applications will begin September 1, 2005 and continue until the position is filled. EEO/AA.

435 CALIFORNIA STATE UNIVERSITY, DOMINGUEZ HILLS (Los Angeles) invites applications for a full-time tenure-track position at the rank of Assistant or Associate Professor in accounting for appointment in the 2006–2007 academic year. Minimum qualifications are a Ph.D./D.B.A. in business administration with a major in accounting. Other appropriate doctorates or terminal degrees in a related disciplines and ABDs will be considered. A record of or potential for effective teaching and scholarship in any of the following: auditing; accounting theory; international accounting; and government and non-profit accounting. Ability or promise thereof to teach in the fields above as well as in advanced and intermediate accounting and in M.B.A. online accounting courses. Ability or a commitment to working in a multiethnic, multilingual, and multicultural environment. For more detailed information, please go to www.csudh.edu/facultyaffairs/facultypositions.htm and http://som.csudh.edu. To ensure full consideration, apply by September 15 when review of applications will begin.

436 SACRED HEART UNIVERSITY, Department of Accounting, invites applications for a position in financial accounting at an Assistant or Associate Professor level, pending budgetary approval. The successful tenure-track faculty appointee is expected to teach undergraduate and graduate (M.B.A.) courses in financial accounting and to demonstrate active research. Salary is negotiable, based on the candidate's qualifications. The College of Business at Sacred Heart University is an AACSB candidate school. A strong commitment to teaching, a completed or near-completion doctoral degree and understanding and commitment to support of the University's mission are required. Applicants are requested to contact the Chair of the Accounting Department, Dr. Benoit Boyer, or the Chair of the Search Committee, Dr. Karen Cascini at Sacred Heart University, College of Business, 5151 Park Avenue, Fairfield, CT 06825; Email Boyerb@sacredheart.edu or Cascinik@sacredheart.edu.

437 SHIPPENSBURG UNIVERSITY, Department of Accounting and Management Information Systems in the John L. Grove College of Business, is seeking candidates for the position of Assistant Professor of Accounting, effective August 2006. Associate level may be considered, depending on qualifications. Earned Ph.D. in Accounting or D.B.A. is required. Terminal degree from an accredited institution is required for tenure. Position requires effective teaching, publishable research, service, and strong communication skills. A demonstration of teaching effectiveness is required as part of the on-campus interview. Position may require teaching M.B.A. classes using videoconferencing technology. Qualified candidates should send letter of application, current *curriculum vitae*, official undergraduate and graduate transcripts, and three letters of reference to: Dr. Scott N. Cairns, John L. Grove College of Business, Shippensburg University, 1871 Old Main Drive, Shippensburg, PA 17257-2299. Review of applications begins November 1, 2005, and will continue until the position is filled. All applicants must furnish proof of eligibility to work in the U.S. upon appointment. Shippensburg University is an Equal Opportunity Employer.

438 TEXAS TECH UNIVERSITY, Rawls College of Business, invites interested parties to apply for a Rawls Professorship in Accounting. The professorship will be supported by a private endowment and may be filled at either the Associate or full Professor level. Candidates must be strongly committed to both effective teaching and scholarly research and must demonstrate a record of successful publication in the top journals in their field of study. Teaching interests in financial or managerial accounting are preferred. Responsibilities include teaching in the undergraduate, master's and doctoral programs, scholarly research, and participation in department, school, and university activities. Salary and benefits are competitive. Please submit letters of interest, along with *curriculum vitae* and references, to: Robert Ricketts, Director, Accounting Programs, Rawls College of Business Texas Tech University, Lubbock, Texas 79409-2101. Applications may also be submitted electronically to rricketts@ba.ttu.edu. Review of applications will begin immediately and will continue until the position is filled. The Rawls College of Business is an Equal Opportunity Employer. Women and minorities are strongly encouraged to apply.

439 WESTERN CAROLINA UNIVERSITY, Department of Accountancy, Finance, and Entrepreneurship, invites applications for a tenure-track position as Assistant or Associate Professor (financial accounting) available for Fall 2006. A Ph.D./D.B.A. in Accounting is required, although ABD candidates will be considered if completion of dissertation is imminent. Certification and accounting industry experience are preferred and a commitment to engagement in the business community is required. The normal teaching load is three courses per semester. An ongoing stream of scholarly activity leading to publication in refereed journals is expected. Screening will begin immediately and applications will be accepted until the position is filled. Applicants must provide a letter of application, *curriculum vitae*, graduate transcripts, and contact information of three references. Address correspondence to: Dr. Susan Swanger, Search Committee Chair, Department of Accountancy, Finance, and Entrepreneurship, College of Business, Western Carolina University, Cullowhee, NC 28723. WCU is AACSB-accredited and is an Equal Opportunity/Affirmative Action Employer.

440 UNIVERSITY OF KANSAS, School of Business, Department of Accounting and Information Systems, invites applications for an Assistant or Associate Professor of Accounting. Application review will commence on October 3, 2005 for this full-time position beginning August 2006. Requirements: a Ph.D., D.B.A., or other doctorate in a closely related field; for Associate: evidence of high-quality research accomplishment with ongoing high-quality research stream; for Assistant: evidence of high-quality research potential. Preferred qualifications: for Associate: ability to provide Accounting curriculum leadership; experience working with Ph.D. students; ability to teach Auditing or Financial; for Assistant: ability to teach Auditing or Financial. Send letter, resume, and three letters of reference to: Accounting Faculty Search Committee, School of Business, 1300 Sunnyside Avenue, Lawrence, KS 66045-7585. For a full description or additional information, contact accsearch@ku.edu or http://www.business.ku.edu/gen/bschool_generated_ns_pages/Employment_Opportunities_m959.html. The University of Kansas is an EO/AA Employer.

441 SAN JOSE STATE UNIVERSITY invites applications for Fall 2006. Three tenure-track Accounting positions are available as Associate, Assistant, Professor, or temporary appointment. Positions with an emphasis in Financial Accounting, Assurance/Systems, and Taxation are available. All candidates must have demonstrated versatility and competencies in subject matter and pedagogy. The teaching assignments are at both graduate and undergraduate levels, including traditional and accelerated formats. All positions are subject to final approval by the University. The minimum credential requirement for tenure-track appointments is a Ph.D. Strong preference will be given to candidates who hold a Ph.D. from an AACSB-accredited university. The application deadline is December 31, 2005 or until the position is filled. Send application letter, *curriculum vitae*, teaching evaluations, and three letters of reference to: Dr. William Donnelly, Accounting and Finance (BT850), San Jose State University, One Washington Square BT 850, San Jose, CA 95192. Interviews may be scheduled for AAA with Dr. William Donnelly at (408) 924-3493 or donnelly_b@cob.sjsu.edu. San Jose State University is an Equal Opportunity/Affirmative Action Employer.

442 LOUISIANA TECH UNIVERSITY, School of Professional Accountancy, seeks applications for Assistant or Associate Professor. Appointment is for January 2006, but will consider applicants for Fall 2006. Accounting doctorate is required, as is demonstrated ability for high-quality scholarship, certification preferred. Requires teaching at the upper division and graduate levels, publishing discipline-based research, and involvement with the accounting doctoral program. Interest in financial accounting or auditing is preferred. Applicant review will continue until position(s) filled. Salary is highly competitive. Located 65 miles east of Shreveport and 30 miles west of Monroe, enrollment totals approximately 12,000 students. Please send applications or letters of inquiry to: Thomas J. Phillips, Jr., Director, School of Professional Accountancy, Louisiana Tech University, PO Box 10318, Ruston, LA 71272. Phone: (318) 257-2822; Fax: (318) 257-4253; Email: phillips@cab.latech.edu; Website: http://www.cab.latech.edu. EEO/AA/ADA. Women and minorities encouraged to apply. Member of the University of Louisiana System.

443 UNIVERSITY OF SOUTH FLORIDA, Tampa, School of Accountancy, invites applicants for tenure-earning Assistant or Associate Professor beginning Fall 2006. This position will involve teaching in undergraduate and master's programs and involvement with the Ph.D. program. Other duties include conducting research leading to publications in refereed journals and service to the academic and professional communities. Ph.D. or near completion and a specialty in accounting information systems and/or auditing required. To apply, or for more complete description of position and minimum qualifications, contact: Robert M. Keith, School of Accountancy, College of Business Administration, University of South Florida, 4202 E. Fowler Avenue (BSN3403), Tampa, FL 33620-5500. Phone: (813) 974-6516; Fax: (813) 974-6528; Email: rkeith@coba.usf.edu. Applications close January 12, 2006. Position is subject to final university funding. USF is an Equal Opportunity/Affirmative Action Institution. For disability accommodations, call (813) 974-6389 a minimum of five working days in advance. Under Florida law, applications and meetings are public.

444 UNIVERSITY OF SOUTH FLORIDA, Tampa, School of Accountancy, invites applicants for tenure-earning Assistant or Associate Professor beginning Fall 2006. This position will involve teaching in undergraduate and master's programs and involvement with the Ph.D. program. Other duties include conducting research leading to publications in refereed journals and service to the academic and professional communities. Ph.D. or near completion and a specialty in auditing and/or accounting information systems required. To apply, or for more complete description of position and minimum qualifications contact: Robert M. Keith, School of Accountancy, College of Business Administration, University of South Florida, 4202 E. Fowler Avenue (BSN3403), Tampa, FL 33620-5500. Phone: (813) 974-6516; Fax: (813) 974-6528; Email: rkeith@coba.usf.edu. Applications close January 12, 2006. Position is subject to final university funding. USF is an Equal Opportunity/Affirmative Action Institution. For disability accommodations, call (813) 974-6389 a minimum of five working days in advance. Under Florida law, applications and meetings are public.

445 UNIVERSITY OF SOUTH FLORIDA, Tampa, School of Accountancy, invites applicants for two tenure-earning Assistant/Associate Professors beginning Fall 2006. These positions will involve teaching in undergraduate and master's programs and involvement with Ph.D. program. Other duties include conducting research leading to publications in refereed journals and service to the academic and professional communities. Ph.D. or near completion and specialization in financial or managerial accounting required. Secondary interest in auditing or AIS is welcome. To apply or for more complete description of position including minimum and preferred qualifications, contact: Robert M. Keith, School of Accountancy, College of Business Administration, University of South Florida, 4202 E. Fowler Avenue (BSN3403), Tampa, FL 33620-5500. Phone: (813) 974-6516; Fax: (813) 974-6528; Email: rkeith@coba.usf.edu. Applications close January 12, 2006. Position is subject to final university funding. USF is an Equal Opportunity/Affirmative Action Institution. For disability accommodations, call (813) 974-6389 a minimum of five working days in advance. Under Florida law, applications and meetings are public.

446 UNIVERSITY OF SOUTH FLORIDA, Tampa, School of Accountancy, invites applicants for two tenure-earning Assistant/Associate Professors beginning Fall 2006. These positions will involve teaching in undergraduate and master's programs and involvement with Ph.D. program. Other duties include conducting research leading to publications in refereed journals and service to the academic and professional communities. Ph.D. or near completion and specialization in managerial or financial accounting required. Secondary interest in auditing or AIS is welcome. To apply or for more complete description of position including minimum and preferred qualifications, contact: Robert M. Keith, School of Accountancy, College of Business Administration, University of South Florida, 4202 E. Fowler Avenue (BSN3403), Tampa, FL 33620-5500. Phone: (813) 974-6516; Fax: (813) 974-6528; Email: rkeith@coba.usf.edu. Applications close January 12, 2006. Position is subject to final university funding. USF is an Equal Opportunity/Affirmative Action Institution. For disability accommodations, call (813) 974-6389 a minimum of five working days in advance. Under Florida law, applications and meetings are public.

447 TEXAS STATE UNIVERSITY–SAN MARCOS, Department of Accounting, invites applications for two tenure-track Assistant/Associate positions beginning Fall 2006. Candidates must have, or anticipate receiving by the end of May 2007, a Ph.D./D.B.A. in Accounting from an AACSB-accredited university and be "academically qualified" under AACSB standards. However, a Ph.D./D.B.A. in MIS can substitute for AIS applicants. Candidates must be able to teach in one or more of the following areas: auditing, taxation, accounting information systems, and cost/managerial accounting. Please send your letter of application, resume, and the names of three references to: Dr. Lucille Montondon, Search Committee Chair, Department of Accounting, Texas State University–San Marcos, 601 University Drive, San Marcos, Texas 78666; or email: lm03@txstate.edu. For full consideration applicants should have complete files by September 1, 2005. Texas State University–San Marcos is an Equal Opportunity Employer. Women, minorities, and individuals with disabilities are encouraged to apply.

448 TEXAS STATE UNIVERSITY–SAN MARCOS, Department of Accounting, invites applications for the McCoy Endowed Chair in Accounting. Candidates should have the appropriate qualifications for appointment as a tenured Full Professor in the Department of Accounting. Appointment will begin Fall semester 2006. Candidates must have a Ph.D./D.B.A. in Accounting from an AACSB-accredited university, an outstanding record of high-quality research, continuing research agenda, distinguished teaching at both the undergraduate and graduate levels, and exceptional service record. All areas in accounting will be considered. Please send your letter of application, vita, the names of three references, and two samples of publication to: Dr. Roselyn Morris, McCoy Endowed Chair in Accounting Search Committee Chair, Department of Accounting, Texas State University–San Marcos, 601 University Drive, San Marcos, Texas 78666; or email: rm13@txstate.edu. For full consideration applicants should have complete files by October 14, 2005. For complete description of the position, please visit http://www.business.txstate.edu/cba/employment.htm. Texas State University–San Marcos is an Equal Opportunity Employer. Women, minorities, and individuals with disabilities are encouraged to apply.

449 UNIVERSITY OF NEW HAMPSHIRE, Whittemore School of Business and Economics, invites applications for a tenure-track position in Accounting at the Assistant Professor level beginning in Fall 2006. Applicants must have an appropriate terminal degree or be well advanced in the completion of their dissertations, and have a teaching interest in managerial accounting and/or accounting information systems. Salary and fringe benefits are competitive and the school provides support for research through subscription to a number of financial databases through the Wharton Research Data Services (WRDS). Applicants should submit a letter of interest, current *curriculum vitae*, three recommendation letters, recent teaching evaluations, and evidence of recent scholarly work to: Dr. Emily Xu, WSBE, Box A, UNH, Durham, New Hampshire, 03824. Application review will begin immediately and continue until the position is filled. The School is accredited by the AACSB and is an Affirmative Action/Equal Employer with a commitment to excellence through diversity.

450 UNIVERSITY OF SOUTHERN INDIANA, College of Business, invites applications for a tenure-track position in accounting beginning August 2006. Candidates seeking the rank of Assistant Professor must have a Ph.D. or D.B.A. in Accounting (or a related discipline). ABDs will be considered at the rank of Instructor until completion of their degree. Preference will be given to candidates with a primary specialization in Financial Accounting (although other areas will be considered). Responsibilities include teaching in multiple accounting areas. Apply (electronically or by mail) with a letter of application, *curriculum vitae*, teaching philosophy statement, and evidence of teaching effectiveness and scholarship to: Dr. Mehmet C. Kocakulah, College of Business, University of Southern Indiana, 8600 University Blvd., Evansville, IN 47712; Phone (812) 465-1730; Email: mkocakul@usi.edu. Information about USI and the College of Business can be found at: http://www.usi.edu and http://business.usi.edu. The University of Southern Indiana is an Equal Opportunity/Affirmative Action Employer.

451 UNIVERSITY OF SOUTH CAROLINA, School of Accounting, invites applications for two tenure-track positions at the Assistant or Associate Professor rank beginning in Fall 2006. Candidates should have a teaching interest in Financial Accounting, Managerial Accounting, or Auditing. Applicants must possess a doctorate or expect to complete their doctorate by August 2006. In addition to being committed to excellent teaching, applicants must be ambitious and motivated researchers. A large percentage of our faculty publishes in leading academic journals. We offer competitive salaries. Please submit *curriculum vitae* and working papers or a defended dissertation proposal, if at the dissertation stage. Submit applications to: Professor Rich White, Moore School of Business, University of South Carolina, Columbia, SC 29208; or Email: whiter@moore.sc.edu. The University of South Carolina is an Affirmative Action/Equal Opportunity institution.

452 UNIVERSITY OF CONNECTICUT, Department of Accounting, invites applicants for two tenure-track openings at the rank of Instructor, Assistant Professor, or Associate Professor beginning Fall 2006. Qualified applicants at the Associate Professor rank must have an earned doctorate as well as possess a reputation for scholarship, success in teaching in business school programs (undergraduate, MS in Accounting, M.B.A., Ph.D., and Executive Education) and service. Qualified applicants at the Assistant Professor rank must have an earned doctorate by August 23, 2006, have good research skills and a strong commitment to teaching and research. Qualified applicants at the Instructor level must have an earned Master's degree and provide evidence of successful work toward the completion of a doctorate degree. Applicants must have teaching interest in Auditing or Accounting Information Systems. However, candidates who can teach in multiple areas are preferred. Review of applications will begin immediately and continue until the positions are filled. Please submit nominations or applications to: Dr. Mohamed E. Hussein, Head Accounting Department, University of Connecticut, School of Business, 2100 Hillside Road, Unit 1041A, Storrs, CT 06269-1041; Email: mohamed.hussein@uconn.edu. For more information, visit http://www.uconn.edu and http://www.business.uconn.edu; search numbers 06A001, 06A003.

453 PURDUE UNIVERSITY, Krannert Graduate School of Management, invites applicants for one or more tenure-track appointments in accounting beginning Fall 2006. Rank is at either the Assistant or Associate Professor level. Candidates for an Assistant Professor position should have (or be near completion of) a doctorate and exhibit the capacity for research publishable in top-tier accounting journals and excellence in teaching. Candidates for an Associate Professor position should have an earned doctorate and an established record of excellence in research, teaching, and service on doctoral dissertation committees. We offer a competitive compensation package. Applications will be reviewed beginning September 15, 2005. Applications should include a resume, representative research output, evidence of teaching ability, and should be prepared to provide at least three letters of reference. Applications should be sent to: Professor Mark Bagnoli, Krannert Graduate School of Management, Purdue University, 403 W. State Street, West Lafayette, IN 47907. Purdue is an Equal Access/Equal Opportunity/Affirmative Action Employer. Women, minorities and individuals with disabilities are encouraged to apply.

454 PURDUE UNIVERSITY, Krannert Graduate School of Management, invites applicants for one Continuous Term Lecturer appointment in accounting beginning Fall 2006. Candidates are expected to teach both financial and managerial accounting predominantly at the undergraduate level and should have demonstrated excellence in teaching. Teaching load is 24 semester credit hours per academic year. Ph.D. strongly preferred but Master's degree with professional certification (e.g., CPA) is acceptable. The initial appointment is subject to renewal based on performance and need. Applications will be reviewed beginning September 1, 2005 and should include a *curriculum vitae*, evidence of teaching performance and three letters of reference. Applications should be sent to: Professor Susan Watts, Krannert Graduate School of Management, Purdue University, 403 W. State Street, West Lafayette, IN 47907-2056. Purdue is an Equal Access/Equal Opportunity/Affirmative Action Employer. Women, minorities and individuals with disabilities are encouraged to apply.

455 CALIFORNIA STATE UNIVERSITY, STANISLAUS, Department of Accounting and Finance, invites applications for a full-time, tenure-track position at the rank of Assistant Professor for Fall 2006. Preferred area of specialization is financial accounting; tax experience is desirable. Candidates must possess a Ph.D. in Accounting from an AACSB-accredited university by December 2006. Professional certification is desirable. Compensation will be competitive, commensurate with qualifications and experience. This position is contingent upon available funding. To apply, please submit a letter of application, updated and complete *curriculum vitae*, three letters of reference, an original transcript from the doctoral degree granting institution, copies of research and publications, and evidence of teaching effectiveness to: Dr. Annhenrie Campbell, Chair, Accounting Search Committee, Department of Accounting and Finance, California State University, Stanislaus, 801 W. Monte Vista Avenue, Turlock, CA 95382. Email: acampbel@athena.csustan.edu. CSU, Stanislaus is an Equal Opportunity/Affirmative Action Employer.

456 JAMES MADISON UNIVERSITY, School of Accounting, invites applications for an tenure-track Assistant Professor position starting August 2006. Candidates should have a teaching interest in Taxation, doctorate from an AACSB-accredited school, prospects for publication of scholarly research, and evidence of excellence in teaching. Review of applicants begins 09/01/2005. JMU is a selective institution of approximately 16,000 students, enjoys national recognition for the quality of its academic programs, and is repeatedly identified as a best buy. The School of Accounting offers bachelor's and master's degrees. To access the required online employment application, paste http://joblink.jmu.edu in your Internet browser. You will be directed to attach a cover letter and resume (including contact information for three references). Please direct questions to: Paul Copley, Director; Phone: (54) 568-3081; Email: copleypa@jmu.edu. JMU is an Equal Opportunity/Affirmative Action/Equal Access Employer and encourages applications from women, minorities and persons with disabilities. Employment offers are contingent upon a criminal history check.

457 GEORGIA COLLEGE AND STATE UNIVERSITY, Department of Accounting, invites applications for Chair of the Department. The J. Whitney Bunting School of Business is AACSB-accredited and has 38 full-time faculty members. The Chair is responsible for promoting quality teaching, fostering research, and maintaining excellence in all programs. The Chair will also teach a reduced load of undergraduate and graduate courses. Applicants should possess a Ph.D. or D.B.A. in Accounting and have demonstrated excellence in teaching and a record of scholarly accomplishments. The appointment will begin January 1, 2006, July 1, 2006, or at a time agreeable to all parties. Submit a letter of application, *curriculum vitae*, and the names of three references to: Dr. Tom Moore, Search Committee Chair, Campus Box 015, 231 West Hancock St., Georgia College and State University, Milledgeville, Georgia 31061; Email: tom.moore@gcsu.edu. An Equal Opportunity/Affirmative Action Employer.

458 AMERICAN UNIVERSITY, Kogod School of Business, invites applications for two Fall 2006 tenure-track appointments in accounting at the rank of Associate or Assistant Professor, subject to final budgetary approval. Teaching and research interests in financial or managerial accounting are preferred. Associate-level applicants should have strong research and teaching record. All applicants must have relevant Ph.D. or anticipate early completion, and must be effective teachers and strongly committed to scholarly research. Responsibilities include undergraduate and master's level teaching, engagement in scholarly research, and participation in department and school activities. Salary and benefits are competitive. Electronic submissions are welcome. Please send *curriculum vitae*, three letters of recommendation, teaching evaluations, and recent published papers or working papers to: Dr. Robert B. Thompson, Kogod School of Business, American University, 4400 Massachusetts Ave. NW, Washington, D.C. 20016-8044; Phone: (20) 885-1956; Email: rthomps@american.edu. To learn about the Kogod School of Business, see http://www.kogod.american.edu/. American University, an Equal Opportunity/Affirmative Action Employer, encourages applications from women and minorities.

459 BARUCH COLLEGE, Stan Ross Department of Accountancy, invites applications for anticipated openings for tenure-track positions at all ranks. Areas of specialization include financial and managerial accounting, taxation, auditing, and information systems. Rank and salary depend on qualifications. Candidates should have a doctoral degree in Accountancy or be close to the completion of that degree. For ranks above Assistant Professor, candidates should have a completed Ph.D. degree, an excellent scholarly record of research, and demonstrated teaching effectiveness. Please submit a *curriculum vitae*, a research paper, and letters of reference by February 15, 2006 to: Professor Donal Byard, Stan Ross Department of Accountancy, One Bernard Baruch Way, New York, NY 10010. Baruch College is an AA/EO/IRCA/ADA employer.

460 THE COLLEGE OF CHARLESTON, Charleston, South Carolina invites applications for Assistant or Associate Professor tenure-track openings for accounting faculty beginning Spring or Fall 2006. Primary needs are in Auditing, Information Systems, Governmental or Financial Accounting. The College of Charleston offers the B.S. in Accounting and Master of Science in Accountancy degrees. Information about our program can be found at http://www.cofc.edu. Candidates should expect to have a Ph.D. degree from an AACSB-accredited university by the time employment begins. Teaching experience, business experience, and professional certification are desirable. We are interested in faculty who want to integrate their research and teaching with a close working relationship with the professional business community. Applicants should send a cover letter, *curriculum vitae*, and names of three references to: Email: koprowskiw@cofc.edu; or mail to: William Koprowski, Department of Accounting and Legal Studies, 66 George Street, Charleston, SC 29424; Phone: (84) 953-7835. The College of Charleston is an Affirmative Action/Equal Opportunity Employer.

461 STANFORD UNIVERSITY, Graduate School of Business, invites applications for tenured and non-tenured faculty positions in Accounting, effective September 2006, from candidates at all applicable stages of their careers who are interested in financial accounting, managerial accounting, tax and other areas. Candidates must have a Ph.D. and the highest level of accomplishment or promise in both scholarly research and M.B.A. and Ph.D. teaching. Applications should include *curriculum vitae* and copies of research publications. Applicants are strongly encouraged to submit applications electronically at: http://www.gsb.stanford.edu/recruiting; upload *curriculum vitae*, publications, and teaching evaluations (if applicable) on that site. Alternatively, you may email electronic materials to: Faculty_Recruiter@GSB.Stanford.Edu; or mail nonreturnable materials to: Faculty Recruiting Manager, Box A, Graduate School of Business, Stanford University, Stanford, CA 94305-5015. Please allow 3 weeks processing. Three letters of recommendation should be sent to that same address. The deadline is January 23, 2006. Stanford University is an Equal Opportunity/Affirmative Action Employer.

462 SABANCI UNIVERSITY, Graduate School of Management (GSM), invites applications for full-time and visiting positions in all areas of Accounting and Finance for the 2006–2007 academic year. Sabanci University, a private academic institution, offers excellent facilities and a light teaching load amid a modern campus located in Istanbul. The University provides faculty members excellent support, including housing on campus or a housing stipend. GSM offers undergraduate, M.B.A., Executive M.B.A., and doctoral degree programs with English as the medium of instruction. For further information, please refer to: http://www.sabanciuniv.edu/gsm/. Applicants are asked to complete an online application form at: http://www.sabanciuniv.edu/English/?BilgiHizmetleri/Ik/Ik.html. Please include ACC005 as the Advertisement Reference Code. Additionally, a *curriculum vitae*, a statement of research and teaching activities, and the names of three references should be sent via email to: Nakiye Boyacigiller, Dean, at: nakiye@sabanciuniv.edu.

463 MIAMI UNIVERSITY, Ohio, Department of Accountancy, invites applicants for a tenure-track position at the assistant professor level beginning Fall semester 2006. Applicants with an interest in teaching and conducting research in financial or managerial accounting will be given primary consideration. Applicants must have a doctorate in accounting or dissertation in process with expectation of completion of degree by December 31, 2006. Professional certification and experience are desirable. Miami University has a national reputation for quality teaching. Both the undergraduate and graduate programs are AACSB-accredited. Salary and benefits are competitive. Information about the faculty and curriculum is available at: http://www.sba.muohio.edu. Please submit your resume and letters from three references to: Dr. Thomas Porcano, Department of Accountancy, Farmer School of Business, Miami University, Oxford, Ohio 45056; or Email: porcantm@muohio.edu. Application screening for interviews will begin immediately. Miami University is an EEO employer. Women and minorities are encouraged to apply.

464 UNIVERSITY OF CALIFORNIA, SAN DIEGO, Rady School of Management (http://management.ucsd.edu/), invites applications for Assistant, Associate, and Full Professor positions in accounting. The positions are expected to have a start date of July 1, 2006. Preference will be given to experienced applicants who have distinguished scholarly records, have demonstrated teaching expertise with graduate students and executives, and are good institution builders. All applicants must have a Ph.D. Salary and appointment levels are dependent on experience and based on University of California pay scales. Please email a detailed *curriculum vitae*, indicating research interests and types of courses taught to: radyaccounting@ucsd.edu. Please reference Job Code: ARACCT and state the level of position you are applying in the subject line of your email. Review of applications will begin on October 1, 2005 and continue until positions are filled. UCSD is an Affirmative Action/Equal Opportunity Employer with a strong institutional commitment to the achievement of excellence through diversity among its faculty and staff.

465 COLUMBIA UNIVERSITY, Business School seeks applications for faculty positions in Accounting. Rank is open. Candidate with an interest in Financial Accounting research will be preferred. We are looking for an outstanding person whose qualifications include a doctoral degree (or close to completion) and evidence of a strong commitment to both teaching and research. We offer a highly supportive research environment and easy interaction with faculty in other disciplines. Salary and benefits are competitive. Please send resume, an unpublished research paper and letter(s) of recommendation to: Professor Nahum Melumad, Columbia University Business School, 610 Uris Hall, 3022 Broadway, New York, NY 10027. An Equal Opportunity/Affirmative Action employer. Women and minorities are especially encouraged to apply. Deadline: January 31, 2006.

466 MIDDLE TENNESSEE STATE UNIVERSITY, Murfreesboro, Department of Accounting, invites applications for two tenure-track faculty positions at the assistant/associate professor rank (position numbers 110190 and 110080), beginning August 2006. Candidates should possess an earned doctorate in accounting (ABD considered if close to completion). Applicants should have a strong commitment to excellence in teaching, research and publication, and service. Women and minorities are encouraged to apply. Department offers an undergraduate degree in accounting, an M.S. degree in Accounting/Information Systems, and supports the accounting concentration in the M.B.A. program. Department earned separate AACSB accreditation in 2004. Review of formal applications will begin October 25, and continue until filled. Submit application letter, resume, transcripts, and contact information for three professional references to: Dr. G. Robert Smith, Jr., Search Committee Chair, MTSU Box 50, Murfreesboro, TN 37132. An EO/AA/AOA/Employer.

467 BAYLOR UNIVERSITY, Department of Accounting and Business Law, invites applications for a tenure-track position at the Assistant or Associate Professor level for Fall 2006 in taxation. A Ph.D. (or ABD) in accounting is required; professional certification is preferred. Applicants must demonstrate research and teaching excellence. Applications, including *curriculum vitae*, three letters of reference, working paper or defended dissertation proposal, and evidence of an active Christian faith commitment should be sent to: Dr. Charles E. Davis, Department of Accounting and Business Law, Baylor University, One Bear Place #98002, Waco, TX 76798-8002; Email Charles_Davis@baylor.edu. Applications will be reviewed beginning November 1, 2005 and will be accepted until the positions are filled. Baylor University is a Baptist university affiliated with the Baptist General Convention of Texas. As an Affirmative Action/Equal Employment Opportunity Employer, Baylor University encourages minorities, women, veterans, and persons with disabilities to apply.

468 UNIVERSITY OF NEW MEXICO, Robert O. Anderson Schools of Management Accounting Department, is seeking a tenure-track Assistant/Associate Professor beginning August 2006, subject to budget considerations. Minimum Requirements: Ph.D. Business/Management; Accounting concentration. Will consider candidates close to completing doctorate. Must be prepared to teach undergraduate and graduate levels. Preferences: Evidence of ongoing research or potential to develop program; compatibility with current department research; strong teaching credentials. All areas of accounting will be considered but preference is given to expertise in Auditing/Assurance Services with professional certification. Best consideration date 11/01/2005, applications accepted until filled. Send hard copies of signed application letter, *curriculum vitae*, one published work or working paper sample and/or dissertation proposal, teaching evaluations, names of three references to: Accounting Search Coordinator, The Robert O. Anderson Schools of Management, MSC 05 3090, One University of New Mexico, Albuquerque, NM 87131. View full posting at: http://www.mgt.unm.edu (About ASM), or http://www.unm.edu/~oeounm/facpost.html.

469 NORTHEASTERN UNIVERSITY, The College of Business Administration, is seeking applications for the Joseph M. Golemme Research Professorship in Accounting. The Professorship is a tenured faculty position with a five year renewable appointment. Applicants—at the Associate or Full level—are expected to be actively engaged in research and publication and to provide research leadership. Additionally, applicants will be expected to teach in the Graduate School of Professional Accounting and in other degree programs in the College. Teaching will be at a reduced level. Candidates must have a doctoral degree and the highest level of accomplishment or promise in both scholarly research and graduate teaching. Please send applications with a current resume to: Marjorie Platt, Accounting Group Coordinator, College of Business Administration, Northeastern University, 404 Hayden Hall, 360 Huntington Avenue, Boston, MA 02115. Northeastern University is an Equal Opportunity/Affirmative Action, Title IX University. Women and minorities are encouraged to apply.

470 NORTHEASTERN UNIVERSITY anticipates openings for two tenure-track positions effective September 2006 at the Assistant or Associate Professor rank in Accounting. Candidates must possess the doctoral degree and have a strong commitment to excellence in teaching and scholarly research. Candidates with an established publication record, teaching experience in financial, managerial or auditing, and some business background are preferred. Salaries are competitive and negotiable. Faculty are actively encouraged to engage in research and publishing activities. Support is available in terms of summer funding, release time from teaching, graduate assistants, and travel. Teaching is at the undergraduate and graduate levels, with graduate teaching in the M.B.A., M.S./M.B.A., and M.S.A. and M.S. Tax programs. Send resumes to: Dr. Marjorie Platt, Accounting Group, 404 Hayden Hall, Northeastern University, Boston, MA 02115: Phone: (617) 373-4647; Email: m.platt@neu.edu. Northeastern University is an Affirmative Action/Equal Opportunity/Title IX Employer. Minorities, women, or persons with disabilities are encouraged to apply.

471 YOUNGSTOWN STATE UNIVERSITY invites applications for a tenure-track position as Assistant or Associate Professor. A Ph.D. in accounting from an AACSB-accredited institution is required, teaching experience and publications are preferred. The successful candidate will teach at the undergraduate and graduate levels, pursue an active scholarly agenda resulting in publications, and provide service to the department, college, university, and business community. Experience in teaching accounting information system courses is preferred. The position carries reassignment time for research, an attractive benefits package, competitive salary, summer teaching opportunities, and a generous travel budget for conference presentations. The appointment begins August 21, 2006. Review of applications will begin December 5, 2005. Send letter of interest, *curriculum vitae*, official transcript documenting academic qualifications, and names, addresses, telephone numbers and email addresses of three references to: Dr. Pete Woodlock, Chairperson, Department of Accounting and& Finance, Youngstown State University, One University Plaza, Youngstown, OH 44555-0001; Phone: 330-941-1873; Email: pdwoodlock@ysu.edu. YSU is an Affirmative Action/Equal Opportunity Employer.

472 CENTRAL WASHINGTON UNIVERSITY, The Des Moines Center of the College of Business, seeks applicants with Ph.D. or ABD for a tenure-track position in the Department of Accounting. The teaching load may include upper-division courses in managerial and financial accounting, information systems. For further details, see the complete position announcement on the CWU website at: http://www.cwu.edu/~hr/jobs/faculty.htm. AA/EOE/Title IX Institution.

473 CENTRAL WASHINGTON UNIVERSITY, College of Business, seeks applicants with Ph.D. or ABD for a tenure-track position in the Department of Accounting in Ellensburg, WA. The teaching load may include courses in the MPA Program and upper-division courses in managerial, financial accounting and auditing. Separate summer school contracts are available depending on enrollments. For further details, see the complete position announcement on the CWU website at: http://www.cwu.edu/~hr/jobs/faculty.htm. AA/EOE/Title IX Institution.

474 UNIVERSITY OF COLORADO AT BOULDER, the Leeds School of Business, in anticipation of approval, invites applications and nominations for the endowed Tisone Chair of Accounting at the rank of Associate or Full Professor. Candidates must have an outstanding record of scholarly research and publication; a record of teaching excellence, and promise of future exceptional contributions. Job duties include mentoring doctoral students and junior faculty, leading and conducting high impact accounting research, teaching at undergraduate and graduate levels, and academic and professional service. For more information visit: http://leeds.colorado.edu/about/interior.aspx?id=525,948,1223,1862. We will begin reviewing applications immediately and will continue until the position is filled. Interested persons should send a current *curriculum vitae*, the names and addresses of at least three academic references, evidence of excellence in research and teaching, and representative publications or working papers to: Email: Connie.Blazon@colorado.edu; or Connie Blazon, Professor Frank H. Selto Chair, Accounting and Business Law Division, Leeds School of Business, University of Colorado at Boulder, 419 UCB, Boulder, CO 80309-0419. The University of Colorado, Boulder is committed to diversity and equality in education and employment.

475 CALIFORNIA STATE UNIVERSITY, LONG BEACH invites applicants for a tenure-track accounting faculty position, Assistant/Associate Professor for Fall 2006. Applicants must hold a Ph.D. or a D.B.A. degree with a major in Accounting and have demonstrated potential for excellence in teaching, research, curriculum development, and service contributions. Professional certification is desirable. Compensation will be competitive and be commensurate with the candidate's qualifications and experience. Applicant screening will begin November 3, 2005 and will continue until the position is filled. Please send a letter of application and *curriculum vitae* to: Dr. Steven A. Fisher, Chair, Department of Accountancy California State University, Long Beach, 1250 Bellflower Boulevard, Long Beach, CA 90840-8504. CSULB is an urban university in the California State University System. It is located three miles from the ocean in the city of Long Beach. CSULB is an Affirmative Action/Equal Opportunity Employer and has a strong commitment to the principle of diversity.

476 UNIVERSITY OF NORTH ALABAMA invites applications for Endowed Chair in Accounting at Associate/Full Professor rank beginning Fall 2006. Requirements include earned doctorate in accounting or closely related field, strong scholarly research record, commitment to teaching, and an active research agenda. Candidates from all accounting disciplines may apply. Teaching and research interests in two areas from Auditing, Financial, Tax, or Accounting Information Systems are preferable, especially Auditing. Professional certification and accounting experience are preferable. Responsibilities include undergraduate and graduate teaching, scholarly research, and university service. Application review will begin immediately and continue until position is filled. Submit application letter, detailed *curriculum vitae*, unofficial copies of graduate and undergraduate transcripts, and contact information for three references to: Director of Human Resources and Affirmative Action, University of North Alabama, UNA Box 5043, Florence, AL 35632-0001. UNA is an Equal Opportunity Employer committed to achieving excellence and strength through diversity.

477 DUKE UNIVERSITY, Fuqua School of Business, is seeking to hire accounting faculty at both the junior and the senior levels. Hiring decisions will be based on the candidate's ability to contribute to the research and teaching missions of the Fuqua School of Business. Doctoral students interested in being considered for an accounting faculty position at Duke should send a current resume, a paper or thesis proposal, and the names of references to: Professor Jennifer Francis, Fuqua School of Business, Box 90120, Duke University, Durham, NC 27708. Such materials should be sent by the middle of January 2006. Candidates for mid-career and senior appointments in accounting should have significant research and teaching records. Persons who are interested in being considered for a mid-career or senior appointment in accounting should send their materials to the above address as soon as possible. For more information, see our recruiting website at: http://faculty.fuqua.duke.edu/recruiting. The Fuqua School of Business is committed to fostering a diverse educational environment and encourages applications from members of groups under-represented in academia. Duke University is an Equal Opportunity/Affirmative Action Employer.

478 UNIVERSITY OF OREGON, Lundquist College of Business, seeks to fill one tenure-track Assistant or Associate Professor position in Accounting, subject to funding availability, effective September 2006. Duties: publishing economics-based research in top academic journals, teaching undergraduate and graduate accounting courses, and supervising Ph.D. students. Appointment with tenure requires formal review. Requires a commitment to working effectively with students, faculty, and staff from diverse backgrounds. Requirements: Completed Ph.D., demonstrated superior teaching competence, record of scholarly publications in *TAR*, *JAR*, *JAE*, and/or *CAR*. Salary competitive. Application review begins October 1, 2005; continues until position filled. Application: Send letter of interest, *curriculum vitae*, copies of research papers, evidence of teaching performance, and three letters of reference to: Dr. David A. Guenther, Scharpf Professor of Accounting, Lundquist College of Business, University of Oregon, Eugene, OR 97403-1208. Fax: 541/346-3341. The University of Oregon is an AA/EO/ADA institution committed to cultural diversity.

479 UNIVERSITY OF OREGON, Lundquist College of Business, seeks to fill one tenure-track Assistant Professor position in Accounting, subject to funding availability, effective September 2006. Duties: publishing economics-based research in top academic journals, teaching undergraduate and graduate accounting courses, and supervising Ph.D. students. Requires a commitment to working effectively with students, faculty, and staff from diverse backgrounds. Requirements: Completed or nearly completed Ph.D. plus evidence of potential for teaching and research excellence. Salary competitive. Application review begins January 16, 2006; continues until position filled. Application: Send letter of interest, *curriculum vitae*, copies of research papers, evidence of teaching performance, and three letters of reference to: Dr. David A. Guenther, Scharpf Professor of Accounting, Lundquist College of Business, University of Oregon, Eugene, OR 97403-1208. Fax: 541/346-3341. The University of Oregon is an AA/EO/ADA institution committed to cultural diversity.

480 ILLINOIS STATE UNIVERSITY, Normal/Bloomington, Department of Accounting, invites applications for a full-time, tenure-track Assistant or Associate Professor position in the Department of Accounting, preferably to begin August 16, 2006, contingent on budgetary approval and appropriate funding. Qualifications: Ph.D. or D.B.A. in Accounting required, with a strong commitment to quality teaching, service and research. ABDs will be considered if substantial progress has been made on the dissertation. Teaching area is open but preference will be given to applicants with primary or secondary interest in financial and/or international accounting. To assure full consideration, please send a letter of application and evidence of qualifications by November 1, 2005 to: Gerald McKean, Interim Chairperson, Department of Accounting, Campus Box 5520, Illinois State University, Normal, IL 61790-5520; Email gwmckea@ilstu.edu. Illinois State is an Equal Opportunity/Affirmative Action university encouraging diversity.

481 MISSISSIPPI STATE UNIVERSITY, College of Business and Industry, School of Accountancy, invites applications for an experienced Assistant or Associate Professor of Accounting, for a tenure-track position beginning Fall 2006. A primary responsibility is to assist with leadership/involvement with the School's doctoral program. Teaching responsibilities include undergraduate and graduate courses in financial accounting. The position requires an accounting doctorate degree; demonstrated excellence in teaching; publication record in nationally refereed journals; and experience in working with doctoral students. In addition, the candidate is expected to participate in certain professional accounting activities and advise students. Professional certification and accounting experience are highly desirable. Salary is competitive and a named professorship (not endowed) may be available for candidate with outstanding credentials. Send letter of interest, current *curriculum vitae*, and names (including contact information) of three references to: Chair, Search Committee, School of Accountancy, Drawer EF, Mississippi State, MS 39762. Application will remain open until a suitable candidate is found. MSU is an AA/EEO Employer.

482 MASSACHUSETTS INSTITUTE OF TECHNOLOGY, Sloan School of Management Accounting Group, seeks new faculty at all levels (Assistant, Associate, and Full Professor) for the academic year beginning July 1, 2006. Applicants will be evaluated on their potential for and record of excellence in research and teaching. Applicants should submit a brief cover letter, an up-to-date *curriculum vitae*, letter(s) of reference, and evidence of research including publications, working papers, or a dissertation proposal to: Professor Paul Asquith, Chair, Accounting Search Committee, MIT Sloan School of Management, 50 Memorial Drive, E52-325, Cambridge, MA 02142-1347. The application deadline is January 15, 2006, but complete applications will be considered before the deadline. MIT is an Equal Opportunity Employer committed to building a culturally diverse and pluralistic intellectual community, and strongly encourages applications from women, minorities, and other historically underrepresented groups. Information about the Sloan School of Management can be found at: http://mitsloan.mit.edu/.

483 ARKANSAS STATE UNIVERSITY invites applicants for tenure-track Assistant/Associate Professor of Accounting beginning August, 2006. Preferred candidates will have a Ph.D./D.B.A. in Accounting from an AACSB-accredited school. Professional certification and experience also desirable. ABD near completion also considered. Candidate must possess a commitment to research and service compatible with our mission. Desired specialties include Auditing and AIS. Send letter of application, current *curriculum vitae*, transcripts and names of three references to: Dr. Paulette Ratliff, Search Committee Chair, Department of Accounting and Law, PO Box 550, Arkansas State University, State University, AR 72467. Arkansas State University is an Equal Opportunity/Affirmative Action Employer and actively seeks the candidacy of minorities, women and persons with disabilities.

484 BUCHANAN INGERSOLL PC is offering an opportunity to join a team to develop and edit a new series of publications on accounting and auditing subjects. The position involves various editorial activities and responsibilities that include acquiring, developing, and evaluating manuscripts, interacting with authors and reviewers, and developing new topics for manuscripts. Requirements include an earned doctorate in accounting or a related field, knowledge of financial accounting, managerial accounting, and auditing, and excellent computer skills, writing skills, and oral communication skills. Professional certification, experience in public accounting or industry, and experience in editing are preferred. The editorial offices are located in Washington, D.C. Salary and benefits are competitive. Email a resume and cover letter to: mooreda@bipc.com.

485 WICHITA STATE UNIVERSITY invites applications for a tenure-eligible Assistant or Associate Professor. Required: Ph.D. or D.B.A. in Accounting (ABD considered) for Assistant Professor; Ph.D. or D.B.A. in Accounting and significant research record for Associate Professor; teaching and research interests in accounting; commitment to quality teaching and research; commitment to interact with the professional community; and demonstrable commitment to diversity. Desirable: professional accounting experience; professional certification; teaching and research interests in accounting information systems, consistent with our needs. This nine-month appointment begins August 2006. To ensure full consideration, submit applications by October 28, 2005. The position remains open until filled. Salary is competitive (position is contingent upon funding). Send a *curriculum vitae* and names of three professional references to: Jeff Bryant, School of Accountancy, Wichita State University, 1845 Fairmount, Wichita, KS 67260-0087; Email: jeffrey.bryant@wichita.edu; Phone: 316-978-6261. Wichita State University is an Equal Opportunity/Affirmative Action Employer.

486 UNIVERSITY OF LOUISIANA AT LAFAYETTE invites applications for Assistant/Associate Professor of Accounting effective August 2005. The successful candidate for the tenure-track position must have an earned doctorate or expected completion date no later than one year from appointment as well as an established record or demonstrated potential for excellence in teaching and research. Industry experience is welcome. A commitment to conducting peer-reviewed published research and related scholarly endeavors is essential. The University of Louisiana at Lafayette, one of eight publicly supported institutions governed by the Board of Supervisors for the University of Louisiana system, has ten degree-granting units. The B. I. Moody III College of Business Administration is accredited by the AACSB International. Candidates should send a letter of application and *curriculum vitae* to: Department Head, Department of Accounting, The University of Louisiana at Lafayette, PO Box 43450, Lafayette, LA 70504. The University of Louisiana at Lafayette is an Equal Opportunity/Affirmative Action Employer.

487 NAVAL POSTGRADUATE SCHOOL, The Graduate School of Business and Public Policy (AACSB- and NASPAA-accredited), seeks all ranks of tenure-track faculty in Accounting and Finance. Applicants must possess good research skills, a doctoral degree in accounting or finance (or close to completion), and evidence of strong commitment to M.B.A. teaching. Applications by email strongly preferred; please send cover letter, current resume, and three letters of recommendation or contact information for references to: busapp@nps.edu. Applicants should submit evidence of teaching abilities and scholarship. Attachments should be in PDF or Word (no zipped files please). Applications may also be sent by mail to: Professor Ira Lewis, Associate Dean for Faculty Affairs, Graduate School of Business and Public Policy, Mail Code GB/LE, Naval Postgraduate School, Room 231, 555 Dyer Road, Monterey, CA 93943-5197. For more information, see: http://www.nps.edu. NPS is an Equal Opportunity/Affirmative Action employer.

488 PEPPERDINE UNIVERSITY, The Graziadio School of Business and Management, seeks an experienced Assistant or Associate Professor in Accounting starting Fall 2006. We value teaching excellence, a solid research record, and professional experience. Contact: Dr. Richard Powell, Graziadio School of Business, Pepperdine University, 24255 Pacific Coast Highway, Malibu, CA 90263; Phone: (310) 506-4874; Email: rpowell@pepperdine.edu. Pepperdine University is an Equal Opportunity Employer and does not unlawfully discriminate on the basis of any status or condition protected by applicable federal or state law. Religiously affiliated with the Churches of Christ, it is the purpose of Pepperdine to pursue the very highest employment and academic standards within a context which celebrates and extends the spiritual and ethical ideals of the Christian faith. While students, faculty, staff and members of the Board of Regents represent many religious backgrounds, Pepperdine reserves the right to seek, hire, and promote persons who support the goals and mission of the institution.

489 UNIVERSITY OF ILLINOIS, The Department of Accountancy, is recruiting faculty for full-time appointments at all ranks. Candidates at advanced ranks must possess a doctoral degree, and candidates for Assistant Professor positions must possess or be near completion of a doctoral degree. Applicants for senior positions should have a strong research record and the ability to participate in doctoral education and curriculum development at the undergraduate and graduate levels. In addition, non-tenure-track Lecturer and Visiting positions are available. Applicants should submit a resume that lists research publications and courses taught. Compensation is competitive and will be commensurate with the appointment level and applicant's record. To ensure full consideration, applications must be received by November 1, 2005. Applications received thereafter will receive full consideration if there are positions still available. Positions may remain open until filled. Proposed starting date is May 16, 2006 or as soon as possible thereafter. Correspondence and resumes should be sent to: Recruiting Chair, Department of Accountancy, 360 Wohlers Hall, College of Business, University of Illinois, 1206 S. Sixth Street, Champaign, IL 61820. The University of Illinois is an Affirmative Action/Equal Opportunity Employer.

490 GEORGE MASON UNIVERSITY, School of Management, invites applications and nominations for Accounting faculty tenure-line positions at all ranks. Special consideration will be given to candidates with teaching and research interests in Accounting Information Systems, Auditing, Corporate Governance, and Managerial Accounting. Successful candidates will have a Ph.D. and a strong commitment to excellence in teaching and scholarly research. Located in Fairfax, Virginia just outside Washington, D.C., the School of Management and Accounting Program are accredited by AACSB International. The School of Management offers undergraduate degrees in business, including accounting, and the M.B.A., E.M.B.A., Technology Management and Bioscience Management degrees at the graduate level. Information about the School of Management is at: www.som.gmu.edu. Applicants must apply online at: http://jobs.gmu.edu/applicants/Central?quickFind=68655. Also, please email your letter of interest and *curriculum vitae* to: Dr. Gopal Krishnan: gkrishn1@gmu.edu. George Mason University is an Equal Opportunity/Affirmative Action Employer.

491 CONCORDIA COLLEGE, The Department of Business, Accounting, and Economics, in Moorhead, Minnesota, has a vacancy in its accounting faculty. We seek a doctorate in accounting for this tenure-eligible, open-rank position. We will consider ABD close to completion. The position starts August 2006. The Department offers majors in accounting, economics, finance, management, marketing, healthcare management, international business, and business education. The accounting program produces 20–25 majors per year. Our graduates perform at the top on the Minnesota CPA examination. We have an excellent placement record. We seek a colleague with high academic and professional standards to teach intermediate accounting and accounting information systems. The normal teaching load is three courses and two preparations per semester. Research leading to publication is expected. Please submit a letter of application, *curriculum vitae*, and three references to: Scot A. Stradley, Ph.D., Chair and Professor, Department of Business, Concordia College, Moorhead, MN 56562. Email: stradley@cord.edu.

492 WASHINGTON UNIVERSITY, Olin School of Business, is seeking faculty in accounting at all levels beginning in August 2006. Candidates for Associate or Full Professor should have an established record of quality research, while candidates for Assistant Professor should be promising research scholars. Successful candidates will be expected to publish high-quality research and teach effectively in the school's Bachelor's, Master's, and/or Ph.D. programs. Candidates should hold a doctorate degree or be close to completion. Salary, teaching load, and faculty support are highly competitive. Applicants should send a cover letter, *curriculum vitae*, and a copy of the dissertation proposal or completed dissertation, or in the case of more established scholars, several samples of the applicant's scholarship. Applications should be sent to: Dean Mahendra R. Gupta, Olin School of Business, Campus Box 1133, Washington University, One Brookings Drive, St. Louis, MO 63130-4899. Early applications receive fullest consideration. Washington University is an Equal Opportunity/Affirmative Action Employer and welcomes applications from women and minorities.

493 WESTERN WASHINGTON UNIVERSITY invites applications for tenure track, Assistant or Associate Professor positions in financial accounting and/or information systems beginning Fall 2006. A doctoral degree in accounting is required by appointment date. Preference may be given to candidates with experience in teaching accounting theory with a writing component and/or advanced accounting. Professional certification preferred. Duties include teaching undergraduate and graduate courses, university service, and scholarly publication. View announcement, including complete list of qualifications at: http://www.acadweb.wwu.edu/hr/Jobs/faculty.asp. Overlooking Puget Sound, Western has 12,000 students and is situated between Seattle and Vancouver, B.C. Both the baccalaureate and M.B.A. programs are AACSB-accredited. Please send letter of application, *curriculum vitae*, transcripts, evidence of teaching effectiveness, and names of three references to: Professor Julie A. Lockhart, Chair, Department of Accounting, Western Washington University, Bellingham, WA 98225-9071; Phone: (360) 650-3202; Email: Julie.Lockhart@wwu.edu. Application Priority Review: 11/10/05. AA/EOE.

494 UNIVERSITY OF PENNSYLVANIA invites applications for positions available July 2006 in Financial, Managerial, and Tax Accounting at all academic ranks. A Ph.D. and demonstrated ability or potential for high-quality teaching and research are required. Interested persons should send a *curriculum vitae* including education, professional experience, publications, personal data, and, if applicable, a dissertation proposal and abstract to: Professor John Core, Accounting Department, University of Pennsylvania, Suite 1300 Steinberg-Dietrich Hall, Philadelphia, PA 19104-6365. The deadline for applications is January 15, 2006. The University of Pennsylvania is an Equal Opportunity Employer. Minorities/females/individuals with disabilities/veterans encouraged to apply.

495 UNIVERSITY OF FLORIDA, Warrington College of Business, invites applications for Director of the Fisher School of Accounting. The Director is also an Associate Dean within the College. Required qualifications include a demonstrated record of scholarly output and effective, innovative teaching that merits a tenured appointment with the rank of Full Professor, and an earned doctorate. The individual should also possess leadership and interpersonal skills necessary to work effectively within the School and the University itself as well as with external constituents. The application deadline is October 15, 2005. Review of applications will begin on that date and continue until the position is filled. To apply, send a cover letter and resume to: Professor Joel S. Demski, Fisher School of Accounting, University of Florida, PO Box 117166, Gainesville, FL 32611-7166. The University of Florida is an Equal Opportunity/Affirmative Action Employer. The selection process will be conducted under the provisions of Florida's Government in the Sunshine and Public Records law.

496 MICHIGAN STATE UNIVERSITY, Eli Broad College of Business, Accounting and Information Systems, East Lansing, MI, invites applications for at least one tenure-track faculty position beginning August 2006. The primary need is for experienced faculty in financial reporting or auditing; beginning Assistant Professor applicants and applicants in other areas also are welcome. All candidates must have a Ph.D. and promise for highest level accomplishments in scholarly research and teaching. Significant research and teaching records are required for Associate/Full positions. Rank/salary will be commensurate with qualifications. Send application letter, *curriculum vitae*, representative working papers/publications, teaching evaluations (when applicable) and names or letters of references to: Recruiting Coordinator, Accounting and Information Systems, N270 Business College Complex, Michigan State University, East Lansing, MI 48824. Review of applications begins October 1st, 2005, and continues until positions are filled. MSU is an Affirmative Action/Equal Opportunity Institution. Handicappers have the right to request and receive reasonable accommodation.

497 MICHIGAN STATE UNIVERSITY, Department of Accounting and Information Systems, invites applications for an Academic Teaching Specialist beginning August 2006. This is a one-year, fixed-term, academic year appointment, which is renewable subject to performance and staffing needs. Candidates must have either a Ph.D. or Master's in accounting with professional certification. Compensation will be commensurate with qualifications. The candidate should have substantial teaching experience and will teach five or six undergraduate, M.S. and/or M.B.A. courses in financial reporting per academic year. An ability to teach other accounting subjects is desired. Send application letter, *curriculum vitae*, names of references, and teaching evaluations for consideration to: Recruiting Coordinator, Accounting and Information Systems, N270 Business College Complex, Michigan State University, East Lansing, MI 48824. Review of applications begins December 1st, 2005 and continues until position is filled. MSU is an Affirmative Action/Equal Opportunity Institution. Handicappers have the right to request and receive reasonable accommodation.

498 UNIVERSITY OF NORTHERN BRITISH COLUMBIA, School of Business, invites applications for a tenure-track position in Accounting commencing July 1, 2006, subject to budgetary approval. Rank is open. Successful candidates will possess a Ph.D. (or be near completion); show evidence of strong research productivity or potential commensurate with appointment rank; and have demonstrated the capability for effective teaching. Salaries are attractive. The closing date for applications is November 1, 2005; however, applications will be accepted until the position is filled. Located in north-central B.C., Prince George is a city with broad cultural, educational, and recreational amenities. Prince George is a friendly community offering a wide range of new housing at very reasonable costs. The region also offers exceptional skiing, canoeing and kayaking, fly-fishing, hiking, and mountain biking. The lakes, forests. and mountains of northern and central British Columbia offer an unparalleled natural environment in which to live and work. Email: bellis@unbc.ca (Dr. Robert Ellis) For more information, visit the following websites: http://www.unbc.ca/, http://www.unbc.ca/, http://www.unbc.ca/whyunbc/north/, http://www.unbc.ca/whyunbc/north/, http://www.mls.ca/map.aspx?AreaID=6297.

499 OKLAHOMA STATE UNIVERSITY, School of Accounting, invites applications for a position opening at the Assistant or Associate Professor level. Applicants at the Associate level should possess a distinguished and on-going record of scholarship. All areas of research emphasis will be considered. Applicants must have a commitment to instructional excellence. This position also carries with it an expectation of significant interaction and cooperation with the College of Agriculture and the Department of Agricultural Economics. This position is located on the Stillwater campus, but applicants could be called upon to occasionally teach on the OSU/Tulsa campus. Applicant screening will begin immediately and will continue until the position is filled. For full consideration please submit *curriculum vitae* by October 15, 2005. Letters of application accompanied by a *curriculum vitae* should be sent to: Professor Don R. Hansen, Head, School of Accounting, Oklahoma State University, 401 Business, Stillwater, OK 74078; Phone: (405) 744-5123; Email osu-soa@okstate.edu. Oklahoma State University is an EEO/AA employer.

500 UNIVERSITY OF ALABAMA, Huntsville invites applications for a tenure-track Assistant/Associate Professor of Accounting starting August 2006 or earlier. Teaching specialization open but preference given to Managerial, Cost, Governmental, or Tax Accounting. Candidates must hold Ph.D. in Accounting from an AACSB-accredited institution. Associate Professor requires established record of research and quality teaching at both graduate and undergraduate levels. Previous professional experience is desirable. The business school is AACSB-accredited. Nestled in the foothills of the Appalachian mountains, the population of the area is 350,000. The area has award-winning schools, excellent transportation, and numerous cultural and recreational opportunities. Send letter of interest, *curriculum vitae*, and names and addresses of three references to: Dr. Dorla Evans, Chair of Accounting Search Committee, College of Administrative Science, UAH, Huntsville, AL 35899. Reference position number 06/07-182 on all correspondence. Review of applications begins immediately. The position will remain open until filled. UAH is an AA/EEO institution.

501 UNIVERSITY OF CALIFORNIA, LOS ANGELES, Anderson School of Management, invites applications for Faculty Positions in Accounting. Applications are invited for positions in Accounting at both the junior and senior levels beginning July 1, 2006. Applicants must have a Ph.D. or be a Ph.D. candidate and exhibit outstanding research capabilities. *Curriculum vitae* and working papers should be sent to: Professor Brett Trueman, UCLA Anderson School of Management, Box 951481, UCLA, Los Angeles, CA 90095-1481. Under Federal law, the University of California may employ only individuals who are legally authorized to work in the United States as established by providing documents specified in the Immigration Reform and Control Act of 1986. UCLA is an Affirmative Action/Equal Opportunity Employer.

502 MILLERSVILLE UNIVERSITY, Department of Business Administration seeks applicants for an Assistant/Associate Professor. The position is full-time, tenure-track, beginning August, 2006. Major responsibility is to teach graduate and undergraduate courses in management information systems (MIS). Expectations include scholarship and professional activities in support of accreditation efforts. Required: ABD in management information systems from an accredited business school (AACSB or ACBSP). Demonstrated ability to teach graduate and undergraduate courses in management information systems. All requirements for the Ph.D. must be completed by the time of reappointment to the third year. Successful interview and teaching demonstration are also required. Preferred: D.B.A. or Ph.D. in Business Administration with a major field in management information systems from an accredited business school (AACSB or ACBSP). Interest in e-commerce. Relevant experience and accomplishments in teaching, scholarship, and industry will influence appointment rank. Full consideration will be given to applications received by October 15, 2005. Send letter of application addressing qualifications, current resume, copies of official transcripts, and three current letters of reference to: Search Committee/AOM0805, Department of Business Administration, Millersville University, PO Box 1002, Millersville, PA 17551-0302. An EO/AA Institution.

503 MILLERSVILLE UNIVERSITY, Department of Business Administration, seeks applicants for a Assistant/Associate Professor. The position is full-time, tenure track, beginning August, 2006. Major responsibility is to teach graduate and undergraduate courses in human resource management. Expectations include scholarship and professional activities in support of accreditation efforts. Required: ABD in human resource management from an accredited business school (AACSB or ACBSP). Demonstrated ability to teach graduate and undergraduate courses in human resource management. All requirements for the Ph.D. must be completed by the time of reappointment to the third year. Successful interview and teaching demonstration are also required. Preferred: A D.B.A. or Ph.D. in Business Administration with a major field in human resource management from an accredited business school (AACSB or ACBSP). Relevant experience and accomplishments in teaching, scholarship, and industry will influence appointment rank. Full consideration will be given to applications received by October 15, 2005. Send letter of application addressing qualifications, current resume, copies of official transcripts, and three current letters of reference to: Search Committee/AAA0805, Department of Business Administration, Millersville University, PO Box 1002, Millersville, PA 17551-0302. An EO/AA Institution.

504 CLAREMONT GRADUATE UNIVERSITY, The Peter F. Drucker and Masatoshi Ito Graduate School of Management at Claremont Graduate University, invites nominations and applications for a tenure-track position in Accounting beginning July 2006. Rank is open, however our preference is to make an appointment at the level of Senior Assistant or Associate Professor. Applicants should be able to teach both financial and managerial accounting at the M.B.A., Executive M.B.A., and Ph.D. levels. A qualified candidate must have completed a doctoral degree and have a strong record of scholarship in a relevant subdiscipline. Executive-level management or consulting experience is desirable. Please direct nominations and applications, and inquiries to: Office of the Dean, Peter F. Drucker and Masatoshi Ito Graduate School of Management, 1021 North Dartmouth Avenue, Claremont, CA 91711; or email: Kathleen.bueno@cgu.edu.

505 UNIVERSITY OF HONG KONG, School of Business, seeks applicants for an Associate/Assistant Professor of Accounting. Applicants should have a Ph.D. degree in Accounting and must be able to teach Auditing, Financial, and/or Managerial accounting subjects at the undergraduate and graduate levels. In addition to being able to demonstrate excellence in teaching, the applicant should commit to high-quality scholarly research, publishable in top-tier academic journals. Professional qualification is also preferred. Candidates for the rank of Associate Professor should have a proven record of high-quality scholarship, teaching, and services. They should be expected to conduct an ongoing active research agenda and serve on committees within the University and external professional organizations. Position available: July 1, 2006 for three-year fixed term with the possibility of renewal. Salary: competitive. Contact: Interested candidates should send *curriculum vitae*, references, and research work sample to: Professor Amy Lau, email: pandatsu@business.hku.hk. Information about School of Business can be found at: http://www.business.hku.hk/.

506 FITCH RATINGS' Credit Policy Department is seeking an accounting professional to assume a senior-level position as Head of Accounting Research & Policy. Will be responsible for identifying critical accounting and financial reporting issues, across the breadth of industries and products rated by Fitch. Highly visible internally; will serve as critical resource on accounting issues that impact credit/ratings analysis. Minimum of 7–10 years relevant experience, a solid understanding of complex accounting issues, advanced accounting degree and CPA, and strong communication and interpersonal skills are required. Knowledge of credit analysis and formal credit training preferred. To apply, please visit: http://careers.peopleclick.com/Client40_fitchratings/BU1/External_Pages/newcandidate.asp?Source=Other&JobID=439. Fitch Ratings complies with federal, state, and local laws governing employment, and provides equal opportunity to all applicants and employees. All applications will be considered without regard to race, color, religion, gender, national origin, age, disability, marital or veteran status, sexual orientation, and other status protected by applicable laws.

507 TULANE UNIVERSITY, Freeman School of Business, New Orleans, LA, invites applications for at least one tenure-track accounting faculty position beginning July 1, 2006. The primary need is for an Assistant Professor in financial reporting, but we also welcome applicants in auditing, managerial accounting, or tax. In addition, we will consider applicants for tenured Associate or Full positions. All candidates must have a Ph.D. and promise for high-level accomplishments in research and teaching. Significant research and teaching records are required for Associate/Full positions. Rank/salary will be commensurate with qualifications. Send application letter, *curriculum vitae*, representative working papers/publications, teaching evaluations (when applicable) and names or letters of references to: Professor Deen Kemsley, Accounting Area Coordinator, A.B. Freeman School of Business, Goldring/Woldenberg Hall I, Suite 504, Tulane University, New Orleans, LA 70118-5669. Tulane University is an Affirmative Action/Equal Opportunity Institution.

508 SOUTHERN ILLINOIS UNIVERSITY, Edwardsville invites applications for a tenure-track position beginning in August 2006. A Ph.D. in Accounting is required, but ABDs nearing completion will be considered. Candidates must be qualified to teach financial accounting and must be committed to excellence in teaching and scholarly research. SIUE School of Business programs are accredited by AACSB International in Business and Accounting at both the undergraduate and graduate levels. SIUE is located on a suburban campus of 2,700 acres approximately 25 minutes from downtown St. Louis, MO. Send *curriculum vitae* to Michael L. Costigan, Chair, Department of Accounting, Campus Box 1104, Southern Illinois University, Edwardsville, Edwardsville, IL 62026-1104. Email: mcostig@siue.edu. SIUE is an Equal Opportunity/Affirmative Action Employer, and applications from women and minorities are especially encouraged. SIUE is a state university—benefits under state-sponsored plans will not be available to holders of F1 or J1 visas.

509 OREGON STATE UNIVERSITY, College of Business, invites applications for two full-time, nine-month, non-tenurable fixed-term Instructor of Accounting positions. Preferred applicants should have demonstrated teaching excellence at the undergraduate level. Primary teaching responsibilities are for introductory accounting courses and advanced financial accounting, auditing, and/or taxation courses to undergraduate accounting majors. Some experience with large section introductory classes is desirable. A Ph.D. is preferred. Salary is dependent upon academic preparation and professional experience. Please send letter of interest, current *curriculum vitae*, recent teaching evaluations, summary information of courses taught, if applicable, evidence of scholarly work, if applicable, and the names and contact information of three professional references. Applications should be sent to: Dr. Roger Graham, College of Business, 200 Bexell Hall, Oregon State University, Corvallis, Oregon 97331-2603; Phone: (541) 737-4028. Deadline December 15, 2005 or until filled. See full position announcement at: http://oregonstate.edu/jobs.

Faculty Position in Accounting and Information Assurance at the University of Maryland, College Park

The Department of Accounting and Information Assurance, at the Robert H. Smith School of Business - University of Maryland, College Park, is seeking either an Associate Professor or Full Professor to strengthen the Department's existing focus on Information Assurance. *Information assurance* typically refers to protection of the confidentiality, integrity, and availability of information and information systems. A candidate should have a strong record in such relevant accounting research themes as earnings management, fraudulent financial reporting, confidentiality/privacy of sensitive business information, internal controls, auditor independence, ethics, internal auditing, costs and capital investments associated with information security, corporate governance, enterprise risk management, accountant's legal liability and securities regulation, and/or the design of accounting systems. This appointment will be accompanied by tenure. The applicant is expected to have a Ph.D. and to have demonstrated research excellence through publications in top academic journals, as well as an excellent record of teaching and service.

The University of Maryland at College Park actively subscribes to a policy of equal employment opportunity, and will not discriminate against any employee or applicant because of race, age, sex, color, physical or mental handicap, national origin, or political affiliation. Applications from all qualified individuals interested in the above noted position are encouraged to send a letter expressing their interest, and a copy of curriculum vitae, by December 31, 2005 to Dr. Oliver Kim at: okim@rhsmith.umd.edu, or at: Robert H. Smith School of Business, Van Munching Hall, University of Maryland, College Park, MD 20742-1815.

Guo Tai An Information Technology Co., Ltd.

China Stock Market, Bond Market, Banking and Economic Databases for Research

China GTA Company, a data Vendor (CSMAR database) of Wharton Research Data Service (WRDS) (please visit WRDS website for the details http://wrds.wharton.upenn.edu/), has been specialized at developing China stock market, bond market, banking and economic databases for international academic and industry researchers. All GTA's databases are designed to be compatible with international database standards and have been verified by more than 100 professors and experts.

Since 2000, GTA has been serving over 3,000 international scholars and researchers from more than 150 highly reputable educational and professional institutions, such as MSCI-Barra, Merrill Lynch, Prudential, China Securities Regulatory Commission, Shanghai Stock Exchange, Yale University, New York University, Wharton School, University of Wisconsin – Madison, University of California at Irvin, University of Reading(UK), Universuty of Pittsburgh, the National University of Singapore, University of Waikato(NZ), Sydney University, University of Hong Kong, Chinese University of Hong Kong, Hong Kong University of Science and Technology, Tsinghua University, Peking University, Fudan University, Shanghai Jiaotong University, Xiamen University, Shanghai University of Finance and Economics, Xi'an Jiaotong University, and Nanjing University. For details, please visit www.chinagtait.com.

CSMAR major research databases (GTA provides also contracted/customized research service)

China Macro-economic

- China Macro-economic Database
- China Industrial Research Database
- China Regional Economy Research Database

China Fund Market

- China Fund Market Research Database
- China Close-end Fund Trade and Quote Research Database

China Bond Market

- China Listed Bond Research Database
- China Bond Trade and Quote Research Database

China Futures Market

- China Futures Research Database

Hong Kong Securities Market

- Hong Kong GEM Stock Market Trading Database
- Hong Kong GEM IPO Research Database

China Stock Market

- CSMAR China Stock Market Trading Database
- China Stock Trade and Quote Research Database
- CSMAR China Stock Market Financial Database—Annual/ Interim/ Quarterly Report
- China Analysts Forecasts Database
- China Initial Public Offering Research Database
- China Listed Corporate Governance Research Database
- China Listed Companies' Merger & Acquisition, Asset Restructuring Research Database
- China Listed Company Shareholder Research Database
- China Stock Market Information Disclosure System
- China Stock Market Related Party Transaction Research Database

China Financial & Economic Information System - Library Edition (CFEIS-LE)

A specially designed information system to fulfill library users' demands. The system provides comprehensive and accurate financial and economic information, and research data on a one-stop research services platform.

The system contains 5 main parts, which are CSMAR Series Database, Securities Information Summary, Financial Report System, Securities Market Ranking, Macroeconomic Index.

China Securities Market Investment Yearbook 2005

Edited by over 30 internationally famous experts and scholars, the Yearbook focuses on the most up to date and complete securities market data, fully records important information of over 1,300 China listed companies, 54 closed-end funds and 116 open-end funds in 2004, and a historical review on the China securities market. For details: http://www.chinagtait.com/daquan/en/

For free sample databases, manuals, brochures, and more information, please contact us or visit our website:

GTA Information Technology Co., Ltd.
Shenzhen China: 86-755-83940235 (Tel) 86-755-83940070 (Fax)
Email: data@chinagtait.com

http://www.chinagtait.com http://www.gtarsc.com
Hong Kong: 852-27812531(Tel) 852-27813773 (Fax)
marketing@chinagtait.com

THE HONG KONG POLYTECHNIC UNIVERSITY

SCHOOL OF ACCOUNTING AND FINANCE

Professor / Associate Professor / Assistant Professor in Accounting (several posts)

The Hong Kong Polytechnic University is the largest government-funded tertiary institution in the Hong Kong Special Administrative Region (HKSAR) in terms of student number. The School of Accounting and Finance has enjoyed the longest history in offering accounting education in the HKSAR. Currently it has a total of 96 full-time academic staff in the areas of accounting, finance, economics and law. The School has adequate resources to support a variety of research interests and activities. The University has designated the School an Area of Strategic Development (ASD), and awarded an ASD grant of HK$5M to support research projects on corporate governance. The School has maintained an excellent network with the Chinese mainland institutions for collaborative works. During the last three years, faculty members were successful in publishing their research papers in top-tier refereed journals, including *The Accounting Review, Journal of Accounting and Economics, Contemporary Accounting Research, Journal of Finance, Journal of Financial Economics, Journal of Financial and Quantitative Analysis, and Accounting, Organizations and Society.*

The School of Accounting and Finance is now inviting applications for several positions at the levels of Professor, Associate Professor and Assistant Professor in all areas of accounting, including financial accounting, managerial accounting, auditing and accounting information systems. The positions are tenable from August/September 2006.

Expected Duties
The appointees will be required to (a) teach undergraduate and/or graduate courses (some evening teaching is expected); (b) conduct research that leads to publications in top-tier refereed journals; (c) supervise graduate student theses/dissertations; and (d) contribute to departmental activities and management. Those appointed at Professor/Associate Professor level will be expected to provide leadership in research, programme/curriculum development, *etc.*

Qualifications and Experience
Applicants should have (a) a PhD degree in a relevant discipline (those who are about to complete their PhD degrees and possess some teaching experience will also be considered); (b) a publication record or strong potential to publish in top-tier refereed journals; and (c) excellent communication skills (all classes and textbooks are in English; possession of Chinese language skills will be an advantage). Preference will be given to those with professional designations and practical experience in accounting. Candidates with excellent teaching and publication records will be considered for appointment at the level of Professor/Associate Professor.

Remuneration and Conditions of Service
Salary offered will be commensurate with qualifications and experience. Applicants should state their current and expected salary in the application. Initial appointments will be made on a fixed-term gratuity-bearing contract. Re-engagement thereafter is subject to mutual agreement. Remuneration package will be highly competitive.

Application
Please submit application form via email to hrstaff@polyu.edu.hk; by fax at (852) 2764 3374; or by mail to **Human Resources Office, 13/F, Li Ka Shing Tower, The Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong.** Application forms can be obtained via the above channels or downloaded from http://www.polyu.edu.hk/hro/job.htm. **Recruitment will continue until the positions are filled.** Details of the University's Personal Information Collection Statement for recruitment can be found at http://www.polyu.edu.hk/hro/jobpics.htm.

University of Massachusetts **Dartmouth**

Assistant Professor of Accounting

The Charlton College of Business at the University of Massachusetts Dartmouth is seeking to fill a position at the Assistant Professor level to teach undergraduate and graduate courses in Accounting, effective September 1, 2006.

Minimum requirements: Ph.D. or DBA in Accounting; the ability to teach at a variety of levels, be able to conduct scholarly research leading to publication in quality academic journals; and be willing to provide service to the university, school and profession. The Accounting/Finance Department prefers applicants whose main teaching and research interests are in managerial accounting and/or taxation though all specialties will be given careful consideration.

University of Massachusetts Dartmouth is one of the 5 state-supported universities in the University of Massachusetts system. With close to 9,000 students, it offers a wide range of majors in the Colleges of Arts and Sciences, Business, Engineering, Visual and Performing Arts and Nursing.

The Charlton College of Business (CCB) is accredited by AACSB International and offers undergraduate and MBA programs. The University of Massachusetts Dartmouth is located on the South Coast of Massachusetts convenient to the metropolitan areas of Boston and Providence and to Cape Cod. A new building opened in October 2004 providing well-appointed faculty offices and meeting rooms. All classrooms in the University have recently been significantly upgraded for technology. See **www.umassd.edu/classroominitiative.** For more information about the CCB see **www.umassd.edu/charlton.**

Faculty will be at the American Accounting Association meeting in San Francisco and welcome the opportunity to talk to potential candidates about the position. Formal review of applications begins November 1, 2005 and continues until the position is filled.

Send by email or regular mail a cover letter, vita, statement of teaching and research interests to **Accounting Search Committee, c/o Dean Eileen Peacock Charlton College of Business, University of Massachusetts Dartmouth, 285 Old Westport Road, North Dartmouth, MA 02747 or epeacock@umassd.edu or the department chair, Ray Jackson at rjackson@umassd.edu.**

UMD is an AA/EEO Employer.

Director Center for Financial Reporting in Global Markets

LUBIN SCHOOL OF BUSINESS, NEW YORK CITY CAMPUS

At Pace University, the foundation of our philosophy is "Opportunitas" – for students to discover their potential and opportunities for our professionals to achieve excellence. If you share our vision and values, we invite you to join us.

The Accounting Department of the Lubin School of Business, Pace University, seeks an exceptional scholar to head the newly created Center for Financial Reporting in Global Markets.

The Center, through its Director, will respond to the increasing need for clarity and knowledge in this area by acting as a catalyst for research and case study development on issues in financial reporting, by sponsoring seminars and an annual conference on emerging issues in the field, and by establishing partnerships with the academic and professional communities.

Candidates must meet all the requirements for appointment as a Full Professor and have a distinguished record of research in the field of accounting. This is a challenging position that will bring distinction to both the Director and the Accounting Department of the Lubin School of Business.

The Lubin School of Business of Pace University is a recognized leader in business education and is committed to preparing professionals for successful careers in the global economy. The School enrolls 5,500 students, and offers an extensive array of undergraduate, graduate and post graduate programs and hosts a number of research and outreach Centers on campuses in New York City and Westchester County. The Lubin School of Business is fully accredited by the AACSB International.

Salary and benefit package is competitive. Please submit curriculum vitae, representative publications, and three letters of reference to

Pace University, Rudolph Jacob, Chair, Accounting Dept.
One Pace Plaza, New York, NY 10038

Visit us at www.pace.edu

Pace University is an affirmative action/equal opportunity employer that values and encourages diversity in its students, faculty and staff.

PACE UNIVERSITY

ted States Postal Service

tatement of Ownership, Management, and Circulation

ublication Title e Accounting Review	2. Publication Number 0 0 4 - 0 0 0	3. Filing Date September 29,
sue Frequency times a year in January, April, July, & October	5. Number of Issues Published Annually 4	6. Annual Subscription $275
Complete Mailing Address of Known Office of Publication *(Not printer) (Street, city, county, state, and ZIP+4)* 17 Bessie Drive, Sarasota, FL 34233-2399		Contact Person Tracey Sutherl Telephone (941) 921-7747

Complete Mailing Address of Headquarters or General Business Office of Publisher *(Not printer)*

717 Bessie Drive, Sarasota, FL 34233-2399

ll Names and Complete Mailing Addresses of Publisher, Editor, and Managing Editor *(Do not leave blank)*

sher *(Name and complete mailing address)*

erican Accounting Association
7 Bessie Drive, Sarasota, FL 34233-2399

(Name and complete mailing address)

Dhaliwal — The University of Arizona, Department of Accounting, McClelland Hall 301,
30 E. Helen Street, Tucson, AZ 85721-0108

anaging Editor *(Name and complete mailing address)*

ame as above

0. Owner *(Do not leave blank. If the publication is owned by a corporation, give the name and address of the corporation immediately followed by names and addresses of all stockholders owning or holding 1 percent or more of the total amount of stock. If not owned by a corporation, give names and addresses of the individual owners. If owned by a partnership or other unincorporated firm, give its name and address as well as th each individual owner. If the publication is published by a nonprofit organization, give its name and address.)*

ll Name	Complete Mailing Address
nerican Accounting Association	5717 Bessie Drive, Sarasota, FL 34233-239

nown Bondholders, Mortgagees, and Other Security Holders Owning or Holding 1 Percent or More of Total Amount of Bonds, Mortgages, or Other Securities. If none, check box → ☒ None

l Name	Complete Mailing Address

Tax Status *(For completion by nonprofit organizations authorized to mail at nonprofit rates) (Check one)*
The purpose, function, and nonprofit status of this organization and the exempt status for federal income tax purposes:
☒ Has Not Changed During Preceding 12 Months
☐ Has Changed During Preceding 12 Months *(Publisher must submit explanation of change with this statement)*

blication Title ıe Accounting Review			14. Issue Date for Circulation Data Below July 2005	
		Extent and Nature of Circulation	**Average No. Copies Each Issue During Preceding 12 Months**	**No. Copies of Single Issue Published Nearest to Filing**
ɔtal Number of Copies *(Net press run)*			8,771	8,258
d and/or juested culation	(1)	Paid/Requested Outside-County Mail Subscriptions Stated on Form 3541. *(Include advertiser's proof and exchange copies)*	6,248	6,774
	(2)	Paid In-County Subscriptions Stated on Form 3541 *(Include advertiser's proof and exchange copies)*	—	—
	(3)	Sales Through Dealers and Carriers, Street Vendors, Counter Sales, and Other Non-USPS Paid Distribution	—	—
	(4)	Other Classes Mailed Through the USPS	—	—
ıl Paid and/or Requested Circulation *m of 15b. (1), (2),(3),and (4)]*		▶	6,248	6,774
ibution ail *ıples, ɔliment ınd · free)*	(1)	Outside-County as Stated on Form 3541	1,459	974
	(2)	In-County as Stated on Form 3541	—	—
	(3)	Other Classes Mailed Through the USPS	—	—
ɘ Distribution Outside the Mail *rriers or other means)*			—	—
ıl Free Distribution *(Sum of 15d. and 15e.)*		▶	1,459	974
ıl Distribution *(Sum of 15c. and 15f)*		▶	7,707	7,748
ɔies not Distributed			1,064	510
ıl *(Sum of 15g. and h.)*		▶	8,771	8,258
cent Paid and/or Requested Circulation *c. divided by 15g. times 100)*			81%	87%

blication of Statement of Ownership
Publication required. Will be printed in the October 2005 issue of this publication. ☐ Publication not required.

ınature and Title of Editor, Publisher, [✓ Business Manager], or Owner

Date
September 29, 2005

r that all information furnished on this form is true and complete. I understand that anyone who furnishes false or misleading information on this fo omits material or information requested on the form may be subject to criminal sanctions (including fines and imprisonment) and/or civil sanction ing civil penalties).

'uctions to Publishers

Complete and file one copy of this form with your postmaster annually on or before October 1. Keep a copy of the completed for your records.

In cases where the stockholder or security holder is a trustee, include in items 10 and 11 the name of the person or corporatio whom the trustee is acting. Also include the names and addresses of individuals who are stockholders who own or hold 1 perc or more of the total amount of bonds, mortgages, or other securities of the publishing corporation. In item 11, if none, check th box. Use blank sheets if more space is required.

Be sure to furnish all circulation information called for in item 15. Free circulation must be shown in items 15d, e, and f.

Item 15h., Copies not Distributed, must include (1) newsstand copies originally stated on Form 3541, and returned to the publi (2) estimated returns from news agents, and (3), copies for office use, leftovers, spoiled, and all other copies not distributed.

If the publication had Periodicals authorization as a general or requester publication, this Statement of Ownership, Manageme and Circulation must be published; it must be printed in any issue in October or, if the publication is not published during Octo the first issue printed after October.

In item 16, indicate the date of the issue in which this Statement of Ownership will be published.

Item 17 must be signed.

Failure to file or publish a statement of ownership may lead to suspension of Periodicals authorization.

THE ACCOUNTING REVIEW
ISSN 0001-4826

PERIODICALS POSTAGE PAID
SARASOTA FLORIDA
AND ADDITIONAL MAILING OFFICES

POSTMASTER
Send Address Changes To:

AMERICAN ACCOUNTING ASSOCIATION
5717 BESSIE DRIVE
SARASOTA, FL 34233

34314 1 REVIEW
CAL UNIV-135 (2005)
INTERNATIONAL BOOK HOUSE PVT LTD
1 KYD STREET
KOLKATA 700 016
INDIA